SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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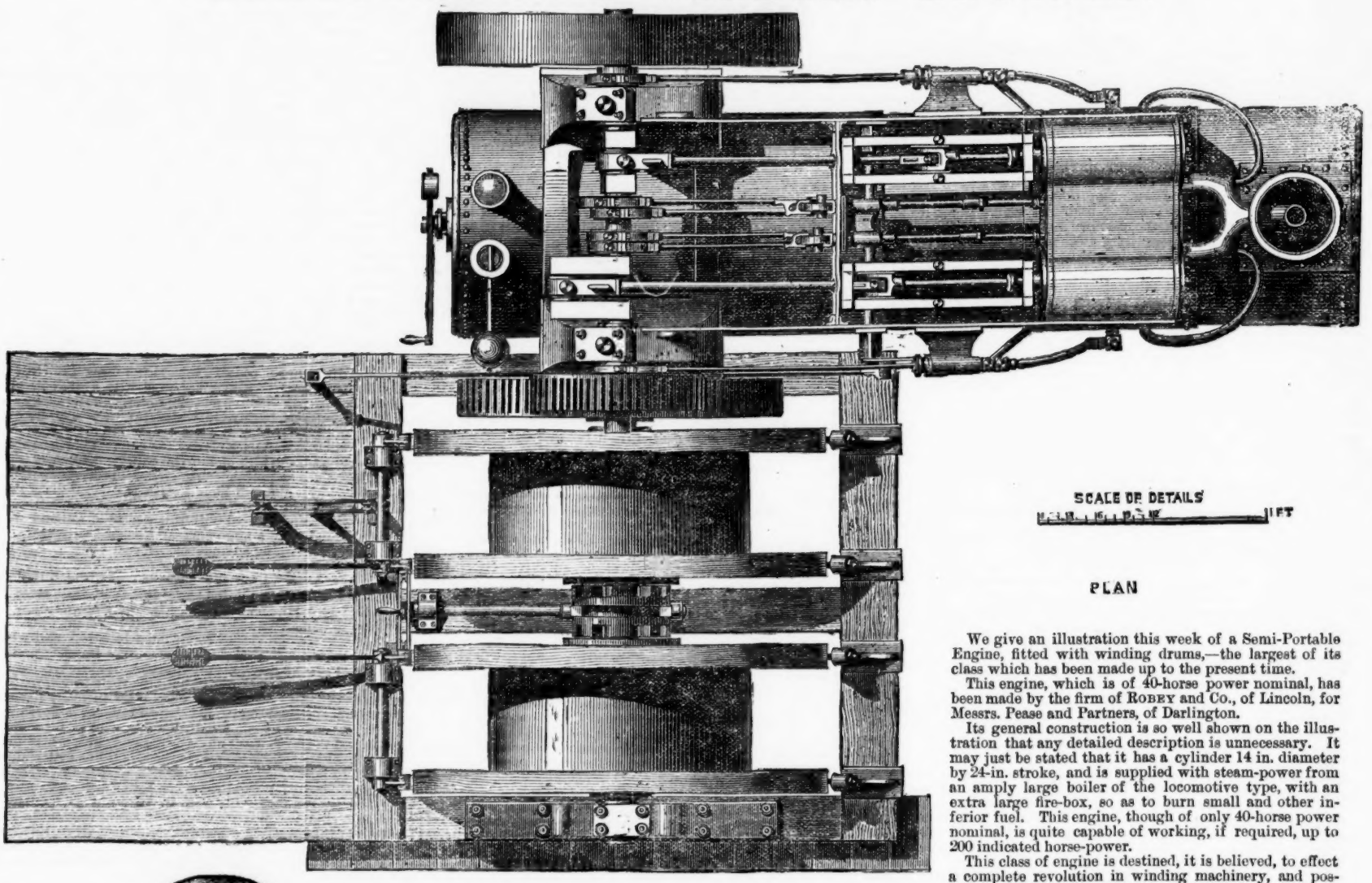
SEMI-PORTABLE WINDING ENGINES.



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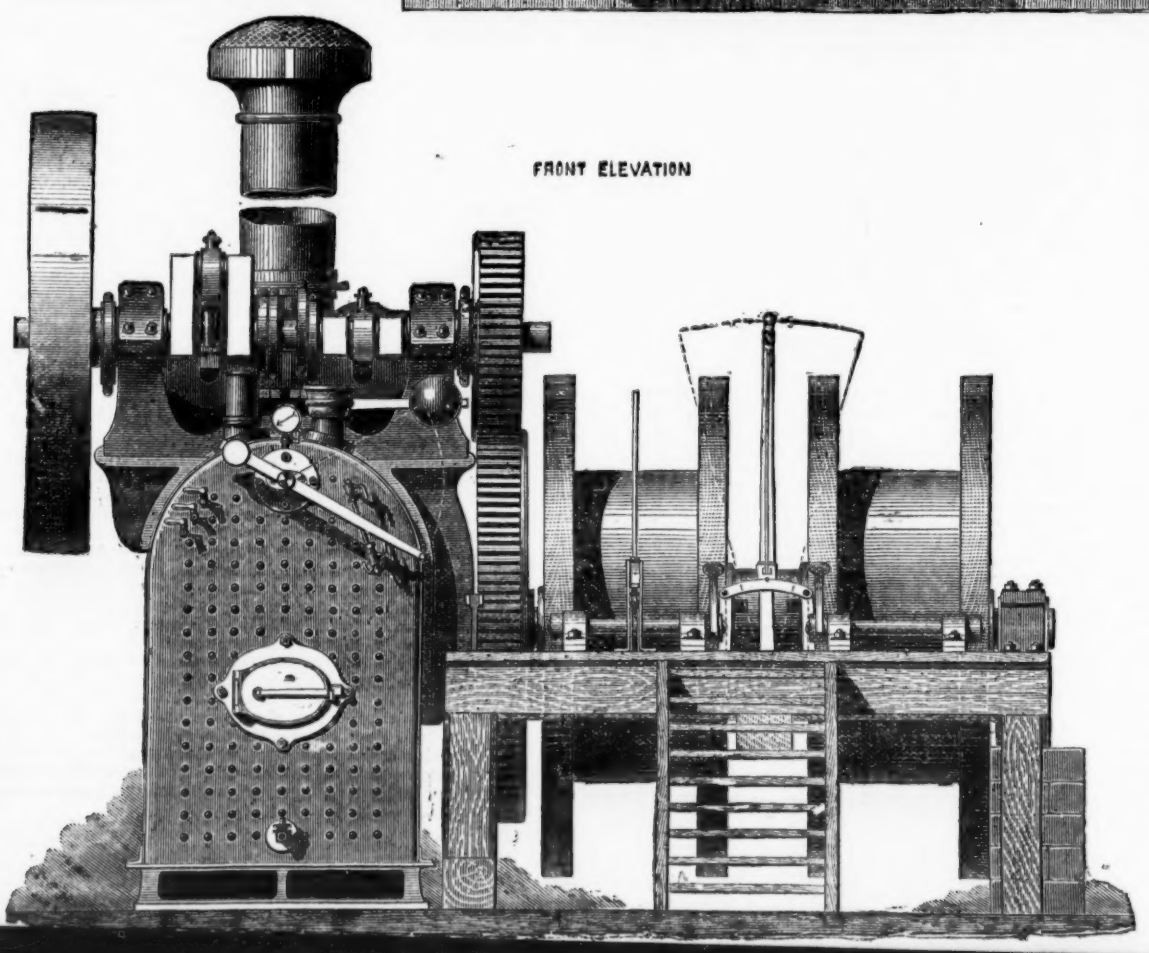
PLAN



FRONT ELEVATION

We give an illustration this week of a Semi-Portable Engine, fitted with winding drums,—the largest of its class which has been made up to the present time.

This engine, which is of 40-horse power nominal, has been made by the firm of ROBEY and Co., of Lincoln, for Messrs. Pease and Partners, of Darlington.

Its general construction is so well shown on the illustration that any detailed description is unnecessary. It may just be stated that it has a cylinder 14 in. diameter by 24-in. stroke, and is supplied with steam-power from an amply large boiler of the locomotive type, with an extra large fire-box, so as to burn small and other inferior fuel. This engine, though of only 40-horse power nominal, is quite capable of working, if required, up to 200 indicated horse-power.

This class of engine is destined, it is believed, to effect a complete revolution in winding machinery, and possesses so very many advantages over the clumsy and old-fashioned fixed engine now almost universally in use, as to require only to be known to come into much more general use.

Messrs. Robey and Co., the eminent portable engine makers, have for some time past devoted much attention to the subject, and have brought out two classes of winding-engines.

One class of engine, which is principally used for sinking purposes, and is made of from 8 to 16-horse power, consists of a steam-engine and boiler, with winding drums, brake lever, reversing gear, &c., complete, mounted upon four wheels.

This engine is also made self-propelling, and is so arranged that it can run itself up to its destination, and commence work at once.

Upon the completion of the pit the engine can be taken away, and put to a similar purpose elsewhere, with as little trouble as it required to start it.

The second class is made from 20 to 40-horse power, and consists, as shown in the engraving, of an engine and boiler complete, with the winding drums fixed to one side of the boiler. One end of the drum shaft takes its bearing in a bracket on the side of the boiler, and the other on a timber or masonry foundation, generally in the engine-house wall.

It will be at once apparent the enormous saving this machinery effects both in time and expenses in getting to work, as compared with the fixed engine and its foundations, together with the flue and chimney required for a Cornish or egg-ended boiler. Nor is this all; the smaller sizes, say up to 25-horse power, require but one man to attend to both stoking and winding, so that the wages of one attendant are saved. But beyond this there is a very great economy in the consumption of fuel effected.

Owing to the greater evaporative power of the locomotive style of boiler employed, together with the use of steam-jacketed cylinders working steam at high pressure expanded through the greater part of the stroke, a high measure of economy is attained; and when we consider the losses due to radiation, leaking of steam-pipes, &c., to which the fixed engine is so much more subject than the new type of which we are writing, the difference in favour of Robey and Co.'s engine becomes something enormous.

It is considered to be within the mark to state that the amount of fuel saved has in some cases reached as much as 75 per cent.

Original Correspondence.

COPPER SMELTING IN CHILE—No. II.

[*Continued from the* MINING JOURNAL *of Nov. 9.*]

OPERATION I.—*Making Regulus:* In this operation we must have yellow sulphurets in our mixture; if, however, we were to smelt these alone we should only get a regulus of about 25 per cent., or at most 30 per cent.; if we calcined them in the open air the percentage would reach 45 or 48 per cent. of copper, which ley would ensure good slags. If we can secure plenty of good bronce morado, or metal de color, for making our mixture, we need not calcine the ore, unless we wish to liberate iron in order to flux the silica, so as to get a good slag; so that if we have abundance of yellow sulphurets with no *free* iron in their composition, or which contain a large amount of silica, calcination is required. The objects to be attained in this operation are—1. A charge easily fused, and which gives good slags; and 2. A charge which will give a regulus more or less of 50 per cent. Generally speaking a charge will contain from ¼d to ½ their quantity of yellow sulphurets, because the quality of the regulus depends on the relative quantity of sulphur and copper in the ore. We now have our regulus, the next operation is—

Making Bar Copper: The furnace is precisely the same as for the first operation. The regulus is first taken to a mill and crushed; the mills at use at Guayacan are of the old-fashioned cylindrical rolls of a very ancient type, and crush about 90 tons of soft regulus a-day; the powdered regulus is then passed through a sieve of 64 holes to the square inch. It is then placed in the calcining furnaces, as described in my last letter, and calcined for about 35 or 40 hours, to extract the sulphur, or rather all but about 3 per cent. When the powdered regulus is put in the furnace its composition is about as follows:—50 per cent. of copper, 25 of iron, and 25 of sulphur, equal to 100 per cent. And when taken out—50 per cent. of copper, and 25 of iron, oxidised; and 3 per cent. of sulphur. The charge for making bar copper is more or less as follows:—

Regulus ....Qtls.	27·00	or Regulus....Qtls.	27·50	} Average ley 35·5 per cent.	
Sulphurets.....	1·52	or Sulphurets	2·05		
Carbonates.....	7·48	or Carbonates.....	7·15		
Slags.....	4·00	or Slags	3·85		
Coal ..... }	3·00	or { Coal	1·10	} Fluxes.	
Cinders ..... }		{ Cinders.....	1·55		
Qtls.	43·00	.....Qtls.	43·25		

As the furnace is tapped on two charges we get more or less the following result:—

17·20 kilos. bar copper..... = 97 per cent.
14·70 kilos. white metal ..... = 65 per cent.

Expressed as follows:—Charge (not including fluxes) 75 qtls. by 35 per cent. (·5 being allowed as loss) = 26·25 fine copper = tap out.

17·20 kilos. bar, at 97 per cent. ..... = 16·69 kilos.
14·70 kilos. white metal, at 65 per cent..... = 9·56 kilos.

31·90 kilos. ..... Fine copper 26·25 kilos.

A furnace in full work turns out in the day about 56·00 kilos. of bar and white metal in the above proportion. In these furnaces 2 tons of ore are smelted to 1 ton of coal. Of course it will be seen that the oxide of iron in the calcined regulus combines with the silica in the carbonates, forming a fusible slag. The coal and cinders are added to reduce the copper. The same precautions are necessary in the skimming and tapping of these furnaces, as noted in the former ones. From all the carbonate ores we get copper at *one* operation, but as the regulus is, of course, not totally calcined, and the ores contain sulphur as well, we get a large amount of "white metal," which is subsequently roasted into blister, and afterwards refined into ingots. We might, however, if we choose, refine the bars at once, in 7 or 8 ton charges, in from 20 to 24 hours. From 17 to 18 bars are produced in each tapping, or (say) 3 tons in the 24 hours. The slag, &c., from the tappings come in for fluxes in other charges; the guaranteed ley of the bars is 96 per cent., and they generally reach 97·5 per cent. Sometimes there is danger of some regulus getting "layered" in between the solid copper, by reason of a bad and thick slag, and thereby deteriorating both the ley and the quality of the bars. The bars average about nine to the ton. The relative proportion of ingots and bars produced in an establishment turning out 8000 tons a-year, would be, more or less, as 3 to 5, or 3000 tons ingots and 5000 tons bars. The principal reason why they calcine the regulus so much is because there is not sufficient coloured metals to carry off the superfluous sulphur which the regulus would have if not calcined. The metales bronceados, having but little oxygen and sulphur, are of course mixed up in small quantities with the other ores. The operations that take place in the furnace are as follows: the coal and cinders will reduce the copper which falls to the bottom of the furnace, the sulphur combines with the oxygen of the air, and goes off as sulphurous acid, and the silica combines with the iron in the ore and forms a fusible and liquid slag. Supposing the ley of our bars comes out low, or below guaranteed value of 96 per cent., we must continue a low heat for some considerable time, and the furnace must be well rabbled up, with the addition, if possible, of more green carbonates and reducing agents to our mixture; if, however, we find the ley of our bars too high—that is to say, 98 or 99 per cent.—we know that we have reduced too much oxide of copper; this was the reason why the *old* Chile bars were so superior to the present ones; the old smelters were too poor to put up calciners, crushers, &c., and so they had to put their ores in *raw* in "colpas," smelting them with wood; the carbon in the wood fire reduced more oxide and sulphur, and the ley of the bars consequently rose to 99 per cent. frequently, but the smelter was only paid, as now, for 96 per cent. The old smelters, when their metals were poor, used to run down two charges and then introduce a *third* charge of rich carbonates on top, and tap on three.

Two men only work each of the above-mentioned calciners, charging, coaling, paddling, and everything; they work each 24 hours on a stretch, and are paid $2, or 8s., each.

The bar furnaces have two *maestros*, or masters, and two helpers (*officiales*) each, working 24 hours. The masters get 2 c. a Spanish quintal on all the ores put in the furnace, and they have to pay out of this $1 to each of the two helps. Supposing, then, that a charge consists of 70 qntls., and we smelt 3½ charges a-day, if a furnace is in good working trim, a master's pay would be 150 qntls. by 4 3-10ths c. (equivalent to 2 c. Spanish), which amounts to $6 50 c. less $2 for the two helps = $4 50 c., or $67 50 c. a month. The helps really only earn 7 reals, or 3s. 6d. each, as the real, or 6d., is left towards charging the furnace *at night*. The bars when they leave the beds are covered with spots of regulus, dirt, sand, &c., and are cleaned and trimmed by contract at the rate of 8 c. per 3 bars. Two tappings a-day is considered good work, which is about equal to 3 tons of bar copper; this amount would not be obtained unless with first-rate coal, as bad coal necessitates frequent skimming and removing of the door, which cools the furnace and throws it back. The large cake at the mouth-bed of the furnace is always broken up and used in the charges again; it contains a good deal of quijo, copper, regulus, &c. The first and second beds on each side of the furnace mouth also contain a good deal of regulus, which comes out with the unmelted quijo and quartz; they also are, of course, re-smelted.

OPERATION III.—*Making Blister Copper:* The charge consists more or less, of 7 tons of white metal from the bar furnaces, introduced into a furnace constructed precisely like the latter, with the exception of having two air-holes on each side of the bridge, diagonally directed over the charge. To commence with, the air-holes are opened and the fire pushed on brisk, whilst the charge gradually melts down, which should be in about six hours; it drips down like melted bacon, and when it is melted the air-holes are closed tightly and the fire raked up to form a slag, which rises in about four hours, and is carefully skimmed off; when the face of the bath is pretty well cleaned, the front door is put up and the air-holes open again, which cools the furnace slightly and cakes the slag, which so can be easily cleaned off. This latter slag is very rich, and carries off most of the impurities, as antimony, arsenic, &c., &c.; the charge is then allowed to roast again, and is again skimmed as soon as a slag forms, as at first; this usually happens three times. After the first skimming the metal begins to "work"—*i.e.*, boil up with a frizzling sound exactly like a frying-pan of melting fat—the furnace being kept at such a heat as to keep the metal in a half-visced state. At the end of 24 or 30 hours, according to the fineness of the metal put in, the white metal gradually "boils off" the face of the copper below, and the latter, as its face clears, changes its frizzling pasty appearance, and appears exactly like a pool of water into which rain drops are continually falling; should there be any holes or faulty places in the furnace bottom the copper will boil up from them like a miniature volcano, and the smelter must not be alarmed at this symptom. From this point the bath must be constantly watched. Generally, in one and a-half or two hours after it has assumed the last-mentioned appearance the surface of the copper gets gradually more and more quiescent, until at last (with the exception of the before-mentioned volcanoes, if the bottom be faulty) it becomes perfectly smooth. Now is the critical time, for if the operation has been well conducted there ought to appear in about a quarter of an hour afterwards a slight ripple on the surface of the bath, just like a ruffled pool, accompanied by a peculiar dark scaly substance floating on the top. Immediately this appears the air-holes are closed, and the fire pushed on for 10 minutes, when the furnace is tapped out into sand moulds as blisted copper. If it has been tapped too soon there will be formed miniature fountains in the beds, caused by the sulphur trying to force its way out. Good metal takes about 24 hours to roast, and requires more heat on, and coarse metal about 30 hours. Supposing a charge of 7 tons is taken, about 5 tons of blister will be obtained. In this operation the whole of the iron and most of the sulphur are driven off, the former being skimmed off with the slag, and the sulphur, combining with the oxygen of the air, going off in the form of sulphurous acid. What little sulphur does remain is subsequently roasted off in the operation of refining. These roasters are fed by a side hole, and have no hopper. By reason of the continued heat to which the furnace is subjected, the bottom frequently rises very much—that is, it cakes, and the copper gets under and raises it up, entailing a loss of copper in the tapping, and the bed gets extremely hard and difficult to break up. A roaster bed will absorb sometimes as much as 15 tons of copper. *Loza*, or broken sea shells, is found to stand better than anything else, though some smelters use plain brick floors with fair results.

In Germany they use an iron floor supported on four columns, and build the bed of the furnace on that; supposing the copper goes through it cools before reaching the ground underneath. Four men charge the roasters and carry away the pigs, &c., to their destination; six reals, or 3s., is paid for charging a roaster, and so much a bed for moving. The "sharp" slag from the roasters averages abou 10 per cent., and the "roaster" slag about 30 per cent., all of which is of course returned to the bar furnaces. The men who attend to the roasters are also employed at the refinery, and are paid $50 per month; seven reals, or 3s. 6d., is paid to the helper, or *oficial*, as he is called, per day of 12 hours, exclusive of the pay for charging the furnace. Sometimes the furnace will not stand the requisite heat for bringing on the copper to blister, in which case it is brought on to *sponge* copper only. It is rather curious that the slag gets thicker the farther it gets towards sponge, and thinner from sponge to blister; this is owing, I presume, to the greater heat.

OPERATION IV.—*Refining for Ingots:* The charge consists of four beds of the roasters, or 20 tons blister copper. The time generally required to refine the charge is about 16 or 17 hours. Four hours before loading a large quantity of cactus root are thrown in at the door of the furnace, and two or three hours after the bath is well poled. This operation is conducted by protruding a pole of "lumas" wood through the door of the furnace, and pressing it well over to the bottom, in order to expose as much as possible of the copper to the action of the carbon; it usually takes about an hour's poling to bring the copper up to the proper pitch. The face of the bath is then covered with fine anthracite coal, to prevent oxidation by the air, and the metal is then ready for ladling. The object of the poling is, of course, to reduce the oxide that is contained in the melted copper, and upon the excellence of the poling does the refining greatly depend; the presence of an oxide would, of course, render the copper brittle. Usually two tests are taken to ascertain if the copper is at a proper pitch. They are taken as follows:—Two ladles, lined with clay, are filled with copper from the furnace, and placed to cool in a horizontal position. If the copper is at the right pitch these tests should set perfectly free from the smallest trace of rising or volcanoes, and when perfectly cool should contain a slight circular depression in the centre about ¼ in. deep, in a 20-lb. ladle. The surface must not present any appearance of longitudinal or horizontal depressions or lines, but that of more than anything else I can liken it to a piece of coarse wrinkled skin, the wrinkles extending in no particular direction. An ingot when cooled should be as near as possible flat, slightly wrinkled, and the rim slightly raised all round equally—in fact, a good ingot (for alloys) may be compared to an oblong pool of water almost full. In pouring an ingot into the mould care must be taken to pour evenly and gradually, or the appearance of it will be spoiled. The copper is ladled as quickly as possible, by four or five men at a time, to prevent the bath of metal going out of pitch. To prevent this during ladling some billets of wood are thrown in at the door of the furnace; but even with every precaution the copper sometimes goes back, entailing sometimes two or three hours to bring it on again: 100 copper moulds are ranged on iron chairs round the front of the furnace, each round being more or less a ton of ingots. Besides these there are the moulds themselves to be made, which contain two ladles full of copper apiece; three of these are run at the end of each round, so that in a 19-ton charge 57 moulds would be made; for making these the men get no extra pay.

In the large 20-ton refinery English coal is burnt, as it was found that a sufficiently strong heat could not be got on the furnace with Chile coal; but in the new 14-ton refinery Chile coal does well enough. The large furnace consumes about 5½ tons of coal in a day, and 1 ton of anthracite coal for every 50 tons of ingots produced. The number of lumas poles required may be put down as one pole to every 1½ ton of copper, and taking a copper works all through about 3½ tons of coal is required to produce a ton of fine copper. The cactus roots, mentioned above, contain a good deal of moisture, and, as it is technically called, "cools" the copper. In charging the refinery care must be taken to clean the blister well, to prevent the sand rising and mixing with the slag; this arises from carelessness in stepping in the sand moulds when made. After the furnace has been poled it is skimmed perfectly clean: this throws it back a little, but the coal subsequently thrown on brings it on again; the fire has meanwhile not been banked up, but if the test ingot is satisfactory the fire is stuffed quite tight before ladling.

Four men charge the furnace, and 12½ c. are paid per ton for charging. A royalty of 62½ c. a ton is paid to the ladlers, who, as before stated, receive $50 a month wages for the roasters as well. It costs as near as possible $5 per ton to refine copper; roasting costs about the same, calcining more or less $3·50 the ton, and crushing about 27 or 30 c. Conversion from regulus to bar may be put down at from $4 to $4·50 a ton.

The loss in a copper works all through may be put down at somewhere about 1½ per cent. One of the most astonishing things connected with this subject is the enormous amount that gets collected in the culverts. In large works, producing 9000 tons a year, the quantity amounts to not less than 350 tons annually of an average ley of 35 per cent.; of course this is recovered and re-smelted. The question arises, how much goes out of the chimneys?

As regards profits to be made by copper smelting, it is impossible to give anything like a correct idea, as everything depends on management—in fact, I would be bound to say that anyone might have access to the books of the most successful company, and yet start for himself and lose money. A great deal depends on the different systems pursued. I may, however, state that ·78 cents is usually considered an average price for reducing 1 quintal metrical of 15 per cent. ores to regulus, and about $40 to $42 for reducing regulus to bar copper, per ton of fine copper. Generally speaking, however, companies would have to calculate $1 and $46 respectively. This formula is supposed to cover all expenses after the ore is actually on the ground. Supposing, then, we take 68 quintals of 15 per cent. ore it will give us about 1 quintal fine copper, allowing for trifling waste. Supposing we pay for it at the rate of (say) 1·42 cents for 10 per cent. with a ·23 cent rising scale, we get, more or less, as the value of the ores $175·00. Adding a trifle less than a dollar for conversion to regulus, we get (say) $240·00 in the form of regulus, with an addition of $45 for conversion to bar, we have $285·00, bar copper being quoted on shore at $297·00, leaving a profit of $12, or 2*l.* 10s., more or less, a ton—that is to say, that a company turning out 5000 tons of ingots and bars ought to show a profit of from 12,000*l.* to 15,000*l.* a year. It is obviously impossible to give any formula, however. Supposing, for instance, a smelter has a contract with a large mine to deliver so many tons a month for one year at a fixed price; copper goes up 15*l.* a ton, and the smelter, of course, as he does not pay any more for labour or coal, reaps the entire benefit of this rise. Ores are bought in Chili either at a fixed contract price, or by the price quoted of bar copper, allowance being made for the conversion of the ores to copper. When it is sold at a fixed rate, a point is taken (say) of 10 per cent. Thus, 10 per cent. is paid, for example, 1·40 cents, and for every unit 10 per cent. 25 cents is paid; then for 12 per cent. ores of course 140+ 50 cents=190 cents would be paid, and so on. When regulated by the price of copper, an example may be given thus: When bar copper is quoted 14·40 cents, a Spanish quintal on the coast, 65 cents more or less would be paid for a quintal of 10 per cent., and 13 cents for every unit over placed in smelter's establishment. So we have on 15 per cent. ores 10=65 and 5+13 65=1·30 cents for 1 quintal of 15 per cent. ores, Spanish weight. Now, 147 Spanish quintals are required more or less to produce a ton of fine copper, so multiplying 147+130=$191·00, adding 78 cents and $42 respectively for conversion, we have an apparent profit of $24, as copper is subject to a 33 cents reduction for duties, &c., which makes the price 14·40−33=$14·17 as price of 1 ton of copper on shore. Interest, commission, brokerage, loss, &c., must be deducted from this. As regards cost of works, &c., I have been informed that an establishment capable of turning out 8000 tons yearly could not be erected under 30,000*l.* to 40,000*l.*, and the capital required to carry it on should not be less than 100,000*l.* By no known method, I believe, can money be so quickly lost as in copper works badly managed, but that copper-smelting properly managed pays, and pays well, in Chile I have no doubt.

OLIVER NORTH.

THE GEOGRAPHICAL, GEOLOGICAL, AND TOPOGRAPHICAL SITUATION OF THE CITY OF ST. LOUIS.

[From my unpublished Geological Survey of the Mining Fields of Iron Mountain Region of St. Louis.]

SIR,—The city of St. Louis is situated, geographically, very nearly in the centre of the Valley of the Mississippi, or basin of the continent, on the west bank of the Mississippi river, and about half-way between St. Paul and New Orleans, and Pitsburg and Denver City.

The topography of St. Louis county consists of a system of ridges branching from a water-shed between the Missouri, Meramec, and Mississipi rivers. This water-shed has a general altitude of 200 ft. above the Mississippi river, and has numerous small ridges, or arms branching from it and winding in serpentine courses, and maintaining this general altitude along their summits, and terminating in bluffs, or low escarkments and declining grounds, towards the Meramec, Missouri, and Mississippi rivers.

The city is built geographically on the ends or termination of this ridge system, and extends some 12 miles up and down the river, the ground rising gently from the river back for one mile to Seventh-street, which follows in part the apex of the first ridge, and is 150 ft. above the river. The ground then gently declines, and rises in a second ridge at Twenty-fifth-street, or Jefferson-avenue, and parts of Grand-avenue, and again slopes and rises in a ridge at Cote Brilliante, or Wilson's Hill, four miles west of the river. This point is some 200 ft. above the river, and overlooks the city.

The geological formation of St. Lous county is limestone, shales, and sandstones of the coal measures, these being covered with alluvial clays from 10 to 20 ft. deep, making the contour of the ridges wavy, and dividing the country into rich rolling prairie, from 100 to 200 ft. above the rivers, and bordered with belts and groves of black and white oak woods; and the country shows many substantial brick mansions, highly cultivated farms, vineyards, orchards, meadows, slopes—forming the most natural grounds for building purposes found in any part of our country. Viewing this rolling prairie, with all its wealth of alluvial soil, its contour of ridge and valley, its springs and meandering streams, it seems as if the laws of nature had here amassed their wealth, and centralised the material resources to supply the wants of a dense and wealthy population; and, not being content with this wealth of soil and art on the surface, had underlaid a large part of this area with coal veins, St. Louis county containing an undeveloped coal basin of considerably over 10,000 acres.

While New York is limited to a barren rocky island, Philadelphia to a low ridge between the Delaware and Schuylkill rivers, Washington City to a flat, sterile, uninteresting region, Chicago to land from 5 to 15 feet above Lake Michigan, and swampy prarie beyond, Cincinnatti to a small circuit surrounded by steep, rocky hills, St. Louis has the most natural contour of surface for elevation of residence streets—deep clay over the limestone for brick, cellars, sewerage, and foundations, quarries of building rock in all parts of the city, wells of pure water in the deep clays in many parts of the city, natural sewerage and dome-shaped hills for waterworks, and essentially combining all the material resources for a great city. London and Paris are built upon tertiary basins, where the soil is thin and rocks generally too soft for good building material. Grand-avenue is 12 miles long, running parallel with the river, and forming a grand broadway from the north to the south end of the city, and is destined in the future, with its fair-grounds, its great parks, cathedrals, churches, waterworks, and private residences, to be the boulevard of the western continent. And yet, when this has been said, we have but commenced to tell of the wonders of a city destined in the future to equal London in its population, Athens in its philosophy, art, and culture, Rome in its hotels, cathedrals, churches, and grandeur, and to be the central commercial metropolis of a continent.

It may be asked, how shall we have cognisance of the laws to give us faith in this being accomplished? Go, then, in imagination, 90 miles south of the city, over the railroad to the Iron Mountains, where is stored above the level of the valleys iron ore sufficient to supply the wants of a densely-populated continent: 1000 tons of this ore now comes daily, over a down grade of 700 feet, to St. Louis. In another year a double-track railroad will be needed. Flanking this iron system is 10,000,000 acres of iron, lead, copper. zinc, antimony, nickel, tin, silver, and gold regions; west of this is another 10,000,000 acres, including South-West Missouri, being fields of similar ores, and part coal. This, you will bear mind, is south of the city. Now let us look east. The four great trunk railroads leading east at 10 miles from the city reach the coal measures, run each over 200 miles of the great Illinois coal basin, where five or six coal veins are piled one vein above the other. To the north this same coal system is found, and all the railroads in North Missouri are crossing more or less over coal veins. To the west, the grand Trunk Pacific railroad, beyond Jefferson City, crosses over vast coal fields, Kansas City being built centrally in this great field.

Coal and iron are the bones and sinews of the most powerful of modern nations. Lead, zinc, and copper, add strength. In the future, the country to pay tribute to this center are the vast cotton fields of the lower Mississippi, the grain-growing regions of the North and West, the argentiferous and auriferous belts of Colorado and Montana.

St. Louis, like ancient Rome, once with its 10,000,000 population, is detined to be flanked and surrounded with a galaxy or cordon of continental cities. Memphis, Kansas City, St. Joseph, Lavenworth, Dubuque, Keokuk, Davenport, Jacksonville, Springfield, Terre Haute, and Indianapolis are a part of these satellites that in the future are to pay tribute to this center—taking in view the fact of their vast material resources, and these being the centre of the great fruit, agricultural and wine belt of the continent.

The people, the Teutonic and Celtic races, are the pioneer people in all the departments of human industry, politics, culture, theology. We apprehend that the most acute vision, even were that mind in harmony with the spirit of the times, and enabled through that means to look back through the dim geologic history of the past, when the economic laws were piling the iron, atom by atom, in these iron mountains, growing the dense flora of the coal plants, repleting the veins of lead, zinc, copper, tin, silver, and gold, and at the same

time comprehend the ridge, valley, spring, prairie, timber, and river systems, and was enabled to go back in the ethnography and heraldry of these populations, and could fuse these elements or facts in the future, and at the same time realise the grandeur of the empires of the past—the Persian, under Cyrus; the Macedonian, under Alexander the Great; the Roman, under the Republic and the 12 Cæsars—that the truth would be forced upon the mind, that in the future this great Valley of the Mississippi will include the center of an empire before which, in wealth, power, and grandeur, all these shall pale; that St. Louis, sitting like a Queen on the banks of the great Father of Waters, will be the central city of this people, the tidal waves of whose civilisation will roll to China and Japan on the west, and to the Bosphorus on the east; and with her continental railroad system, her telegraphs over mountains and under oceans, her vast water communication, will radiate law and order, and become the leading national, mining, and commercial metropolis of the Western hemisphere. JOHN VAN CLEVE PHILLIPS.

Dubuque, Iowa.

ARUBA ISLAND, AND NEW ZEALAND.

COMPARISON OF ARUBA GOLD ORES, AND NEW ZEALAND GOLD ORES, TREATED IN BULK.

SIR,—Since the publication of his letter in the Journal of Dec. 7, the writer has had an opportunity of examining returns of fine gold obtained from 8000 tons of New Zealand ore, between Aug. 9 and and Sept. 2 last, such 8000 tons being the property of the owners of some 60 claims, or of companies working the same. The average return of fine gold per ton of ore in such 8000 tons was 1½ oz., and value 4*l.* per oz., 12,000 ozs.—48,000*l.* The returns of fine gold per ton for such 8000 tons varied from 4 or 5 dwts. of fine gold upwards per ton. Hundreds of tons in lots producing only these smaller returns, and again proving the importance and value of treating the ores in bulk for business.

The public have the printed reports issued by the Aruba Gold Mining Company of the returns of fine gold obtained at Greenville, U.S., per ton from 805 tons of Aruba ores treated there. These ores were classed in 22 lots of different bulk and weight, and the money value is given thereof per ton in each lot. The 22 lots give an aggregate value of the fine gold per ton in each lot, amounting to $1793, which, if divided by 22, gives $81 and upwards as the average value. That is equivalent to a return of 4 ozs. fine gold per ton, value 4*l.* per oz. The separate lots in New Zealand referred to were not of equal weight and bulk, nor were those of Aruba. If, however an estimate of returns from Aruba, under the head of "from ores," *inclusive of returns from all sources*, not open to the New Zealand companies or claims, and not included therein, at 1½ oz. fine gold per ton, and that in 12 months after works in Aruba are fairly in full operation 200,000 tons of auriferous ore, or drift, are passed under proper stamps, and through mills, or efficently treated in any other way, a return of 1½ oz. fine gold per ton, the yield would be 300,000 ozs. per annum, and at 4*l.* per oz. would produce 1,200,000*l.*, a sum sufficient, after paying reasonable expenses of treatment, to repay the entire capital of the Aruba Gold Mining Company twice over, and leave a magnificent property for the fortunate shareholders. Such a result may be said to be within the bounds of possibility and probability, whatever uncertainties may have hitherto attended the imperfect working of gold fields limited in extent, and subject to many masters. All Aruba asks is a clear stage and no favour, beyond capital, skill, industry, and honesty. VERUM.

Dec. 24.

AN AMERICAN'S VIEW OF THE TIN MINES OF CORNWALL.

SIR,—It occurred to me whilst reading the subdued epistle of Mr. G. W. Baker, in the Supplement to last week's Journal, that it is much to be regretted that there were not institutions which could teach common sense as well as letters, as he appears to be afflicted with a constipation of the former and a redundancy of the latter. The gentleman seems to be surprised that anyone should possess the temerity to take up the gauntlet he so injudiciously threw down. If he is at all susceptible of wisdom he may yet learn that there are more things in heaven and earth than is dreamt of in his philosophy. He maliciously emphasises the appellative "defender" of Cornish mining—from the involuntary action, it is to be presumed, of irrepressible truth—because he has already learnt that it can be defended, imperfect as it may be, against such clumsy and ill-advised attacks as he was disposed to visit upon it. I have no intention of being severe, although I know it would be easy to be so, and that the way in which he has treated both the subject and myself would be my sufficient justification if I were so disposed. Defective philosophical speculations can avail nothing against practically demonstrated fact. I heartily sympathise with our friend on his being tantalised by a few working miners and loafers whilst he was engaged in erecting a machine intended eventually to supersede the Cornish pet—"the low-pressure condensing steam *pumping*-engine"—by a thing which their speculations seemed to apprehend might stand as good a chance of being pulled into the shaft as that it could haul a skipload of stuff from the bottom of the mine to the surface. His efforts may be very laudable and praiseworthy in attempting to supersede the Cornish steam pumping-engine—for the term "pet" can apply to no other—by improved machinery, but we incline to the opinion that his boasting has taken unjustifiable precedence of the fact, and that there is a wide and—so far as he is concerned—an unattainable difference between the former and the latter.

I could myself say something on this part of the subject from his own statements, independently of any other data—except facts pertaining to the iucontestible efficiency of the Cornish steam pumping-engine—but shall at present content myself with saying that to supersede the Cornish pet, as his animus constrained him to term it, by anything within the limits of his capacity is very much like a puny liliputian contending with a giant. The Cornish steam pumping-engine is very much like the Cornish stamps as to its invulnerability of principle—each may be susceptible of many improvements in the detail, and both are alike impregnable as to the main principle of their construction.

It will be readily seen by the generality of your readers that the weakness of my opponent's position led him to diverge from every point in controversy, and to lapse in the indulgence of a historical notice of the steam-engine, which did not form the subject of contention between us. It reminds one of the old adage of "drowning men catching at straws."

The gentleman demurred in his last letter at my plainness of speaking, although in a former one he himself indulged in self-laudation because he was sufficiently bold to call things by their proper names—*vide* his second letter. In my last I asked him of what use it was to timber shafts which were sufficiently firm without to be self-supporting, and also what were the principles and peculiarities of Cornish tin dressing, two important points of practical mining which he instanced as faulty at the Boscaswell Downs Mine, but to neither of these questions has he vouchsafed a reply—from the most forcible of all reasons, I presume.

In his last letter Mr. Baker states that during the past 20 years immense progress has been made in washing devices in Germany, by which I suppose he intends the separation of ores from their gangue associations. I, therefore, claim to be excused if I now ask him which of those devices would be efficient in Cornish tin dressing, or whether he thinks that either of them would be? It appears that my opponent has been beaten by Cornishmen both at home and abroad; as he states that Cornishmen—working miners—objected to the introduction of the single-handed drill and giant powder in Colorado; this I admit they did, but upon what ground he has not thought proper to enlighten us, and I will here inform you. It was, first, because they knew their own importance and indispensibility as miners, and its being much easier to work double than single-handed; and, secondly, because the fumes of that explosive were found to be injurious to their health. The result was, no doubt, a compromise, as it was in California. The men proposed to lease the mines—to take them on tribute—and to furnish their own powder, so that it might be immaterial to the owners what kind they used. These propositions were acceded to, but it was still competent, and not only so, but the duty of the owners or their agents to stipulate how the mines should be worked; and here let me say that when Cornish agents let pitches—sections of the mines upon tribute—they impose the conditions on which the respective pitches are to be worked, and any infringement or violation of such conditions is followed by fines, or the absolute forfeiture of the pitch and all the ores broken and monies which might otherwise be due to them under and by virtue of such contracts. No Cornish agent worthy of being accounted such would ever allow tributers—lessees of mines—to deposit their debris, or any portion thereof, on the lode upon which they were working; and not only so, but would stipulate that the ground should be properly supported with timber, and that such timber should be placed at a sufficient distance from the lode at all parts of the mine as to admit of easy accessibility thereto, and provide at the same time the necessary facilities for future working. If working miners, especially tributers, were to be allowed to work mines in their own way they would most assuredly work them in their own interests as much as possible, and in this, as things go, they would be justified. Agents are middle men between working men and their employers, engaged to protect the interests of the latter and to dispense justice to the former.

Would Mr. Baker be good enough to inform us who were the agents of the mines in Colorado which were worked by Cornish agents in the way he complains of? and whether, in so doing, they violated any of the conditions of their respective contracts? as it seems to me an unqualified absurdity for the party of the first part of a contract to complain of a party of the second part if all the conditions and covenants were legally observed and fulfilled. And, lastly, by way of apology for his ill-advised meddling, he says:—"Those representing an investment in Cornwall to the extent of nearly 60,000*l.* informed me that the evils arising from the bigotry of Cornish agents and the pernicious habits of Cornish miners cause great perplexity in view of any change for the better. They assert that the discipline of the men must be improved, better machinery introduced, and the waste remedied, or their enterprise will prove a misadventure." Need I say that if that particular enterprise depends upon such contingencies it must be considered a doomed mine, unless their machinery, men, and mining are of a class decidedly exceptional, from beginning to end, to anything else in Cornwall. I may, however, say, in passing, that it is the first time I have ever heard of Cornish miners being insubordinate at home, and I am now decidedly of opinion that the terms employed in the paragraph to which this refers were made use of, like many others, from the same source, without due consideration of their import. In conclusion, I would inform Mr. Baker that the representations of an investment amounting to 60,000*l.* is comparatively but an infinitessimal fraction to the mining interests of Cornwall.

Liskeard, Dec. 12. ROBT. KNAPP.

THE RED RIVER.

SIR,—I notice that a good deal has been said in the Supplements to the *Mining Journal* about the waste tin that finds its way down the so-called Red River. I think there are only 16 tin mines that empty into this river, and which, take the lowest calculation, is found to contain 40,000*l.* of tin a-year. This speaks for itself, and proves without any doubt that some great improvement is required in the dressing department in some or all of these mines. It is evident if the dressing was properly handled, instead of some of the mines now making calls on the adventurers they would be in the Dividend List. Some say that everything has been done that can be done to save the tin in the mines, but this I deny. I do not for one moment think but the agents are doing, and have done, all to the best of their knowledge to remedy the evil, and so far have failed, but the time is not far distant when we shall see a different mode in dressing the tin slimes, and that instead of, as now, 40,000*l.* a-year going away, that 5000*l.* will not be found in the Red River.

I will now say a word about stamping. Every mine where there is a large, hard, tinny lode should have a Stone-Breaker; this not only saves a great expense from the old mode of spalling by manual labour, but the stamps will get through so much more work in the same time. Quick stamping and good coffer way is a step in the right direction, but not of so much importance as many of your correspondents seem to imagine, because there is a certain class of tin that requires to be stamped as fine as flour in order to get all the tin out of the stone. It is evident from this that if this class of tin comes out of the stamps not well pulverised it must go back again, otherwise great will be the waste that goes away with the rubbish.

I do not know the class of tin that is most found to go down the River, but if rough it is the most easiest thing imaginable to clean all this class stuff in the mine by a self-acting machine, but if it is the very fine slime tin the task is more difficult; nevertheless, although it appears difficult, it is to be accomplished. It is a fact that much fine tin goes off in the water unnoticed, but this can be easily saved in the mine. By the present mode of working slime the fine tin will always go away in the foul water, and in order to prevent this a different mode must take place in dressing. I should not have troubled you with these remarks, but that the Cornish men are considered the best miners in the world—that is, to take mining in all its branches—and I believe that they are; and I should be very sorry to see or hear of a stranger coming into Cornwall to remedy this loose manner in tin-dressing, which is so easy to be accomplished.

Cardiganshire, South Wales, Dec. 23. T. H.

THE RED RIVER.

SIR,—Mr. Ennor has commenced a series of letters on the subject of the tin carried down the Red River. He thinks that the tin so carried is much more than ought to go down from the mines. He intimates that the agents of the mines, being concerned in the stream works, send down tin for their own benefit. He says, also, that the tinstuff is reduced too much by the stamps, thereby rendered so fine as to be carried down in larger quantities than is necessary. As to the quantity carried down the stream, or that part of it which is utilised, I can say nothing definite. No doubt a great deal goes to sea, but the streamers on river secure a considerable quantity—probably 50 tons per month.

I cannot suppose for a moment that any agent connected with either of the mines adjacent to the river, even if interested in the stream, would, if he could, injure his employers by robbing them. But what agent would be so unwise as to risk such an act? He could not do it himself; he would have to be in league with the labourers to do it, who would be sure, sooner or later, to divulge the secret. Again, if he sent down the tin it would have, probably, to pass through several stream works before it reached, if ever it would reach, those in which he is concerned; and it is not likely, even if secrecy could be kept, that he would send down tin for his neighbours' benefit. The idea is absurd.

Now, as to the reduction of the tinstuff. It cannot be reduced to any given dimensions without the production of slime, and that slime containing tin, which would find its way down the river, as it does at present. The tinstuff raised in every mine in the locality must be pulverised (reduced to powder), or the mining companies would be greater losers than they are now, because the tin in general is so finely disseminated in the rock. To prove that the reduction is not excessive, I will cite the fact that the streamers reduce the sand still further after its arrival at their works. Capt. R. Perry, one of the streamers, near Rosewarne Mills, who has a grant of only 60 yards in length on the river, has at work 32 heads of stamps. Jackson, Rule, and other streamers have stamps also, for the same purpose. These facts show that the tinstuff is not reduced too low at the mines. I may also say, as another fact, that the stuff stamped by the streamers pays better than the slime, because less manipulation is necessary to render it marketable. We know that samplers of tinstuff invariably pulverise the samples, that they may find the full produce of tin.

Can Mr. Ennor, Capt. Teague, or any other gentleman inform me, or the mining companies who are interested in the retention of tin at their works, how it can be prevented from going down the river? If anyone can give this information it will be found very valuable to all the mines, and the streamer highest up on the river would take advantage of such knowledge, to keep the tin from passing on to his next neighbour, the contiguous stream worker. It is a very easy thing to say that the tin ought not to pass down the stream, and to condemn the agents for defective knowledge or action, and yet not to suggest how they may do better. I wish that those who find fault would be good enough to say how it may be avoided.

Truro, Dec. 24. R. SYMONS.

N, ENNOR ON TIN STAMPING AND DRESSING—No. III.

SIR,—I showed in my last that tin may be reduced to invisible atoms and carried off to the sea. To allow this is a most unprofitable proceeding, neither is it required. Tin should be stamped, as formerly, with light heads and with rougher grates and more grate room; they should also be better fixed. Tin is now confined in the stamps until a large portion is reduced to atoms, which then swim away. Under the present plan, as long as the tin is in heavy particles the bulk falls back again under the heads, and the slow stamps give them time to settle down for 50 other blows, and it is only by a chance shot from the fall of the heads that the tin goes direct against the holes and escapes through them. I notice the majority of grates are only 9 in. square, and at mid-day all except about three or four inches is choked and has to be cleared; thus stamps with such heads and grates are bound to reduce the tin to invisible atoms, which are lost. You now catch only the visible particles; the invisible ones are not caught at all. Why, then, reduce it to an invisible state? I am quite aware that tin dressers will say that the tin in stone is in very minute particles, but that, I argue, is a very strong reason why it should not be reduced low, as that is sure to reduce a large quantity of tin which was in particles to atoms, and what is the use of that when the troubled water takes it to the sea and it is gone for ever. It should be liberated at once by grates having larger holes, where all the tin reduced to particles would be able to escape. I admit a portion of what would pass out would be "hitch" tin, but every one of these hitch grains is to be caught.

Suppose the tinstone worth 2 cwts. to the ton of stone, all the stuff from the stamp should pass through rough grates and then through my patent self-acting jigging machine, the stamp would then drive it on to my saddle grate at once, when all the tin down to the size of the holes would pass into the hutch, and the rough and hitch tin would be found in the sieve to be shovelled out when necessary. This sieve empties itself of all the waste at the opposite end to that from which it comes from the stamps, and if one jigger is not enough put two following each other; the cost is comparatively nothing, as it only requires emptying when full. The contents, or ragging, should be put under a rubber or in a light compact three-head stamp; the ragging would be found to be worth 6 cwts. of tin to the ton; then all the tin would be found in the hutch or sieve. And with the rough saddle grates all the tin down to the grate size would be sure to go through at every splash of the water and very little tin would be found in the slimes, and if no particles are found in the slimes few or no atoms would go to the sea. In order to finish the portion which passes the jiggers it should be passed through a round griddle, dividing it into two portions—the rough to one buddle and the fine to a second, all self-acting. I invented the round centre middle buddles over 30 years ago, and used them extensively in the Mendip Hills, 20 years before they were adopted in Cornwall; consequently, I think the public will suppose I know how to use them, but I observe they are not properly used in Cornish mines. To catch slime tin the stamped ore should be divested of all its slime as early as possible, when it should be worked by itself; now, it is all worked rough together, and a great deal, I say, of even the best slime tin hangs in the rougher portions and is thrown out as waste with the "rows" to go down the Red River, and this is independent of all atoms which go off.

I venture to assert that atoms not allowed to go to the sea, but confined in the beds of the river, will unite and form particles, and if they, perchance, meet a substance they have affinity for they will unite and become even massive. This may appear to some strange, but I have not a doubt but that tin atoms meeting and lying together will join two or three particles lying near to them.

I have another remark to make respecting the ragging found in the sieve, which might be termed best work, which should either be rubbed down or passed through a good 3-head or 4-head stamp; this should have two slime pits, one for the day and the other for the night, and after the water has stood 12 hours then let off the clear water. The dressing water from all good work should go into a similar pool, not as now altogether, in search of a river squatter.

I will ask the tin dressers where they are confined for space if they could not catch all the hitch tin in the rows by self-acting jiggers fixed in the stream, thus catching the rows which are washing off to the squatters below, and the escaping particles also would all be found in the hutches. You are now attempting to rub down, and many even stamping, the rows, but if passed through self-acting jiggers you would retain only about one-sixth part of the quantity which would require to be re-worked—the ragging with a rubber and the hitch tin with a buddle. If you were to do this you would find no squatter below having silver-mounted harness.

My remarks thus far refer only to tin which requires little or no burning. I will in another letter discuss tin which is contaminated by sulphur and arsenic.

I noticed some one, in your Journal of the 14th inst., said that tin in contact with arsenical mundic is a recent discovery, but he must have been misinformed, as I know tin was burnt to lighten and carry off the arsenic long ago, for I have seen the man shovelling out "rows" arsenic from the flues with his mouth and legs bandaged over 70 years ago, and he will find amongst the Stannary laws one stating that a ring fence of one acre of land should be built to enclose the chimney to keep cattle off, although I have known cattle poisoned by eating the grass far beyond that boundary.

N. ENNOR.

THE STANNARIES COURT.

SIR,—I read with great interest the correspondence in the Journal relating to the Stannaries Court. Your correspondents are not alone in the mortifying experience which they express, nor in the opportunities for observation which have furnished point to their just and admirable critiques. Permit me also to offer some remarks upon this notorious centre of cabal and clique, this ready instrument of wrong and powerful medium of oppression. It cannot be too often reiterated that the "Law Amendment Association" has made two reports recommending the immediate and utter abolition of this costly machinery for inflicting evil, and harassing for years its unfortunate victims. That it should be allowed to exist after the sweeping condemnation of such a body is a disgrace to our legal administration.

The prime and also very potent mover in all matters in the Stannaries Court is the person who is called the Registrar, who has a claim upon any number of official aliases. He *is* registrar, and is also liquidator, plaintiff, and *taxing* master. He in the last aspect of his legal chameleonism taxes his own bills of costs—those of his opponent, to whom, as official plaintiff, he is in antagonism—and those also of his own solicitor. In fact, he is plaintiff, advocate, judge, and jury. Instances have been known of cases remaining a dozen years before the Court; although, in a recent appeal case, the Lords Justices of Appeal decided against this ubiquitous official, and dismissed the case with costs against them, expressing their astonishment and indignation that a cost-book company should be six years in course of liquidation by the Court of Stannaries. Instances have occurred of shareholders, whose names have been taken off the books of the company by the authority of the Court, being summoned before it, after a great number of years, to show cause why their names should not be placed on the list of shareholders, and when proof was given that the name was removed by the Registrar's authority, they were told the name must be placed on the books *pro forma*, in order to be taken off again, and the victim had not only to undergo all the anxiety connected with his citation, the loss of time, travelling long distances, and the expense incidental to this, but the costs of his own citation as well.

In the session of the troublesome year 1866 the House of Commons ordered returns of mines ordered to be wound-up in the Stannaries Court, under the provisions of the Companies Act, 1862. This order, either intentionally or by accident, was totally inadequate for the purpose for which it was ostensibly made, as it only comprised directions for showing the date in each case of the filing of the petition; and in what state the proceedings were at the period when

the report should be returned. These returns were printed in July of the same year, and are now authentic parliamentary papers, which furnish, notwithstanding their glaring insufficiency, a very formidable *exposé* of the working of the system. Still, information of the most valuable nature was withheld, and for shareholders are nearly useless.

On a former occasion attention was called to this Court, which I humbly think to be of sufficient importance to repeat:—"When a company passes into the Court, the unfortunate shareholder knows something about it, but when it is there some time he knows nothing about it whatever." In fact, the longer a company is in the Court the more calls the unfortunate shareholder has to pay. From 1862 to 1866 upwards of 50 companies passed into that Court, entailing a large amount of needless expenditure, and in not a few cases ruin. The truth is the Court offers every encouragement to the lawyers to keep a company in the Court until they do for their own advantage, and that of the man whose functions are—like Joseph's coat—of many colours. These men, like Pharoah's lean kine, eat the fat ones up. They revel in the luxury of confiscating other people's property for their own advantage. The Court which should at reasonable intervals furnish the shareholders with *all* information, positively gives none. The Registrar is, like the veiled prophet of Khorassan, very mysterious, and an awful person in his authority and power while the veil is on; but, as in the case of the prophet, let him lift the veil, let truth be seen, and be dazzled no more. This is what Parliament should do—strip him of his disguise and allow his *official* deformity to be seen in its actuality.

Divesting our language of figure, the public requires to know what companies have passed into the hands of their Grand Vizier of the law with unlimited authority? What number of companies liquidated? What the total debts of each when the Court took cognizance of it? What is the amount standing to the credit of each company, and the interest paid upon it? What amount left for the shareholders? This is vital information. Let the Government and the law reformers set it in motion. A Sufferer.

Helston, Cornwall, Dec. 23.

THE STANNARY COURT.

Sir,—Capt. Teague, the highly respected and successful manager and purser of Tincroft, Carn Brea, Wheal Kitty (St. Agnes) and other works, has inaugurated a movement which should receive the hearty welcome and co-operation of every mining company in the two western counties. The legislature gave us the Act constituting this Court when no County Court was in being—at least, not in its present effective condition. Now that we have a County Court we can very well and very joyfully dispense with the Stannary Court, thereby saving a very large annual expenditure which is now charged in the mines. The judge has 1500*l.* a year, the registrar 900*l.*, secretary 200*l.* (the latter a sinecure), and there are five clerks, a collector, and a constable! I suppose the entire cost of maintaining the whole machinery is upwards of 4000*l.* a year; but the *expense* of its maintenance is not the only cause of complaint, nor, probably, the chief one. The *delays* are greatly complained of. A creditor petitions for the winding-up of the affairs of a mine, his petition is heard, and thereupon the registrar takes the mine in charge, a bailiff is sent to keep possession of the effects on the mine. The solicitor employed by the petitioning creditor begins his bill of costs, and by the time that the winding-up is completed, it may be in 8 or 10 years! such bill, which is charged on the estate, is a fearful document. Hence the estate which, if administered in a fair way, would pay 20s. in 1*l.*, does not, perhaps, pay 10s. The longer the affair is kept open the longer will be the lawyer's bill, and the less amount divisible amongst the creditors. The machinery appears to be most *unwieldly*, for the affairs of a mine which should be settled in a few months remain open many years. South Wheal Kitty (Lelant) was put into liquidation in the year 1861 or 1862, and the winding-up is scarcely completed yet!

It is desirable that every mining company in the two counties should petition Parliament on the opening of the next session for the extinction of this Court, and for the enlargement of the powers contained in the County Court Act.

I am heartily glad that such an independent gentleman as Capt. Teague has taken up the matter. I hope by the miners making common cause against this evil the desired result will be attained. The Stannary Court is generally detested. Miners.

Redruth, Dec. 24.

DARTMOOR—ITS MINES AND MINING.

Sir,—I have wondered what sort of place Dartmoor was, but now I know something of it. I have had to drive several times across the highest part every morning, a distance of five miles, sometimes in a shower of rain and wind that required all our strength to hold on, so that I can speak feelingly. Well, it is rough, and yet under its rough coat there is abundance of riches to captivate the miner. There are valleys there where the old men, as they are called, raised many hundred tons of tin, and there is plenty waiting for the present generation to dress and send to market.

Everything is tending to turn the produce of Dartmoor into something real; for instance, the railway has within these few weeks been brought to the bottom of the mountains, so that the ore is carried to Plymouth from the mines for about 6s. Well, then, there is plenty of water-power for dressing, and plenty of stuff to stamp, and with the improved machinery nearly double the work can be got through: and, what is still better, when the tin is dressed it requires no roasting, and, therefore, instead of the grates being 120 holes to the inch 40 will do. So that, taking all the circumstances together, if the young men will only work with the same energy as the old men, and with the present appliances, it is quite impossible to say what may be done.

I would just mention a few things that ought to be guarded against—Do not begin in winter to do any outdoor work, have everything covered in in summer, and always put the back of your building to the south-west, and as soon as possible. Launders should never be carried across a valley on poles to the water-wheel, but always on the ground. At one mine where I have been these launders were nearly carried away and destroyed, for which there is no occasion. There is another contrivance which ought to be done away with, and that is an elaborate system of balance-bobs and flat-rods to simply pump the water out of a shaft sinking at the same mine. Now, any engineer in Devon would put them in the way to do that without so much waste of power, or any rods at all. Now, Sir, I have given you my ideas about Dartmoor, and what can be done, and if it is done some other writer a few years hence will be able to give a better account of its wealth. J. Walker.

James-street, Old-street, Dec. 26.

ADULT EDUCATION—WHEAL SETON.

Sir,—Great stir and excitement have prevailed of late throughout this country respecting juvenile education, a movement of which I entirely approve. We all know that the children of the poor in general have been allowed to grow up "like wild asses' colts," the parents caring for them little more than they care for horses, cows, pigs, &c., that care being limited to "rearing" their offsprings as mere animals. The middle classes of society have done a little better, causing their children to learn the "Three R's.!" The adult population of the middle classes give ample evidence of educational neglect in early life. The conduct of some of the shareholders in Wheal Seton, who attended a meeting at that mine on Monday last is described as "uproarious." "As a rule mine meetings are so temperately conducted that it is a great surprise to find that the meeting was characterised by an amount of confusion and uproar entirely foreign to gentlemanly discretion and forbearance." It is very difficult to teach adults, because it is difficult to convince them of their ignorance; but such men as Messrs. Thomas, Rule, Angove (a holder of one share), Carter, Davey, and some others who were then present, should attend an evening or some other school, to learn to behave themselves with common decency. They are now scarcely fit for the company of gentlemen—they were on that occasion little better than *bears* in a bear garden. Their object was to carry their resolutions by clamour, involving the removal of the present executive from Wheal Seton, and to bring in Capt. Teague as manager. Why? Because, I presume, they want to get the price of shares raised, that they may sell them at advanced prices. Whenever Capt. Teague takes the management of a mine the price of shares rises immediately. One cannot contemplate the conduct of some sharedealers without disgust. Their schemes to get money by questionable means are numerous. As few of them can spare time to attend during the usual school hours, an evening school should be opened in Camborne, to teach the ignoramuses good behaviour. Probably a large room can be rented, and an instructor obtained, in that town. I dare say that Capt. Josiah Thomas, Mr. W. B. Smith, and Capt. John Tonkin would favour them with lectures on such subjects as "honesty," "gentlemanly behaviour," "sobriety," and some other practical lessons, so necessary to be acquired by brokers, "rags and bonemen," &c.

Redruth, Dec. 20. Observer.

MINING IN NORTH WALES.

Sir,—I am glad to see, in the Journal of last week, that a company is being formed to work the Llyn-y-Pandy Mine, near Mold. This mineral grant embraces a large tract of country, traversed by several well-known lodes, especially those of the Panty-y-Mwyn and Rhyd-y-Mwyn Mines. Taking the whole run of mines in the district—Bwlch, Panty-y-Mwyn, Moldyn, Bryncelyn, Rhyd-y-Mwyn, Llyn-y-Pandy, Fron Fawnog, Hendre, North Hendre, Rhosesmor, &c.—there is not a more productive district in England and Wales. When we consider the state of affairs during the last working of the mines (which have been idle for some years, and now about to be resumed)—Bwlch, Chanticleer, Pant-y-Mwyn, and Moldyn—machinery not sufficiently powerful to cope with the water, the low price of lead ore (then 8*l.* per ton, now 15*l.*), and the royalty (then 1-8th, now 1-16th and 1-18th), it is beyond a doubt that if an engine similar to that now working at Fron Fawnog was put up at one of the several shafts at the Pant-y-Mwyn Mine it would soon have the water out, and such a mine would be opened up as would pay large dividends for many years. It is well known that there are four east and west and two north and south lodes in this extensive grant, containing about 1500 acres, having a length of more than two miles on the course of the east and west lodes, only one having been worked on to any extent. The mine at its deepest point is only 60 fms. below the day level, with large reserves of lead ore.

Operations were carried on by the late company about the centre of the sett, leaving the eastern and western portions of the grant unwrought, so that by continuing the openings east and west a large mine can be opened out without sinking below the 60, or bottom level; but should the present company sink (say) only 10 fathoms, making it 70 fms. below the day level, there would be sufficient depth, taking the number of lodes and length of the sett, to work an immense quantity of ground for a great many years, and return something like 300 tons of lead ore per month; and as the ground in the vein is easy to work, and rich for lead, the cost, taking into account the steam-power that will be necessary for pumping, winding, &c., will be comparatively small, for during the last working ore was raised at 10s. per ton, and the highest price about 4*l.*, leaving a splendid margin for profits with lead ore at 15*l.* and upwards.

The Llyn-y-Pandy being to the north, and adjoining the Pant-y-Mwyn, and containing several lodes, as stated in the reports, all of which can be worked on by erecting machinery on the shafts now available, and the driving of the adit level to intersect the whole of the lodes, which, no doubt, will be a source of wealth to the company, as the ground above the adit can be worked out with but small cost. The grant is of large dimensions, and so many lodes traversing the same, it would take many years, as in Pant-y-Mwyn, to work the ground down to the deepest point sunk. I should say that the two mines will be of great assistance to each other with respect to the water; but, knowing the whole of the district, the Llyn-y-Pandy and Pant-y-Mwyn Companies need not fear as to making immense profits. I venture to say, and it is my unbiassed opinion, from the returns made and the profits realised during the last working (by the Mold Mining Company), with inefficient machinery, low price of ore, and high royalty, that if the present adventurers in these mines will only commence with machinery of such power as will thoroughly drain the mines to the present bottom, they will be able to raise 300 or 400 tons per month in each mine. Cambria.

Shrewsbury, Dec. 26.

THE PROGRESSIVE MINES.

Sir,—In the estimates I ventured to give in my letter of last week as to the future calls in the several mines, I was anxious not to hold out a too hopeful prospect, and I now find that, with respect to one mine at least, I went too far in the opposite direction. It is some time since I visited New West Rosewarne, and I was not aware so great progress had been made. I find that the stamps are not only already erected and at work, but paid for, and it is estimated that a further call of 1*l.* (not 2*l.*, as I wrongly thought) will more than cover all the additional outlay which will be required. Hence the mine has much better prospects than my letters would have led your readers to believe. Observer.

LEGITIMATE MINING.

Sir,—In all my communications to the Journal (and I have been a contributor from the first number) my object has been to encourage and support honest and legitimate mining. I was the first to start Trenow Consols, and then Alfred Consols, on the Cost-book Principle. The outlay in these mines was about 16,000*l.* The third year after active operations the outlay was recouped to the shareholders, and in seven years from that time we divided about 140,000*l.* profits over expenditure (in dividends), and these mines were marketable at from 200,000*l.* to 300,000*l.* In many of the limited companies as much as the capital invested in these mines has been invested in preliminary and useless expenses—for example, Old Wheal Neptune, immediately adjoining Trenow Consols, was started a few years ago with a capital of about 15,000*l.* About 8000*l.* or 9000*l.* of this capital was swallowed up in the offices in London, and great abuse made of the remaining portion of the capital—hence the speculation, as a matter of course, came to grief, and found its way at last into the winding-up part of the Stannary Court, hitherto a very expensive and unsatisfactory way of settling abandoned mines, admitting greater delay, and more expensive results than the Court of Chancery. Formerly when mines were wound-up it was invariably done by a committee of two or three shareholders, chosen by the adventurers, called together for that object, and the expenses did not amount to one-twentieth part they do at present. A. Bennett.

FURZE HILL TIN MINE.

7 heads of stamps 8 weeks (6 days) = 48 days.
Daily average per stamp, 1 ton stone.
48 days × 7 heads (tons) = 336 tons of stone stamped.
Produce as stated, 4 tons 18 cwts. 2 qrs. 6 lbs. of tin ore, which is equal to a produce of upwards of 32 lbs. of tin to every ton stamped.
Does Dolcoath do better than this?

Can any of your readers inform me why not 50 but 100 heads of stamps should not be set to work? The lodes are inexhaustible, and water-power at command. About 5 tons has been produced in 8 weeks by working 7 heads of stamps: 50 heads will yield about 35 tons in 8 weeks, 100 heads 70 tons. Such being the facts, is it not strange that the British public will rush into foreign adventures and loans in the reckless way they do? Your list of foreign mines alone discloses the fact that millions are sunk in such unsatisfactory and distant schemes, the bulk of them worthless. Furze Hill Tin Mine can without difficulty be brought into such a state as to pay annually 50 per cent. upon its capital. Observer.

Dec. 21.

NEW HINGSTON MINING COMPANY.

Sir,—I, as a shareholder in this company, was surprised to learn, from the report of the meeting in last week's Journal, that all the shares were not allotted. I wrote to the office of the company in the spring of the year, some time after the allotment, to know if I could take up more shares, and the official reply was "No; they were all allotted." Now, there must be a fault somewhere, but whichever official is to blame we, the shareholders, will be sadly more so if we allow the debentures to be issued instead of taking up our *pro rata* proportion of the shares, for the only opinion I can hear of the mine is that its prospects are first rate; and, if this present little difficulty is safely tided over, I have no doubt the shares will rise as suddenly as they fell. Our duty, then, as shareholders, is plain—"One and All" to take up our quota, and let us hear no more of the ill-advised debentures.

A Lancashire Subscriber.

UTAH SILVER MINING COMPANY.

Sir,—It is requisite in order to make the questions I asked of Mr. Murphy, and the observations I made at the meeting of shareholders of this company, intelligible to absent shareholders that I should more clearly explain the exact position of the matter.

It appeared from Mr. Murphy's statements that the undressed ore, said to contain about 35 per cent. of galena, mixed to excess with iron pyrites, was crushed by a Blake's stone-crusher to pass through an 8 to the inch sieve (a fineness I very much doubt). The ore, just as it was, was then calcined in a reverberatory furnace, and after calcination was melted with iron ore in a blast furnace. Such a process I stated I believed would result in a loss of metallic lead equal in the whole to more than 50 per cent., and possibly 75 per cent., not taking into consideration the silver which must be lost by such an unsatisfactory mode of smelting.

It must be observed that my remarks applied simply to the process as described by Mr. Murphy, which, in my opinion, must be characterised as a metallurgical failure.

In the Utah mines there is opened up a rich lode of galena ore. Mr. Murphy admitted that Mr. Henry Sewell recommended the German jigger for dressing these ores, and did not deny that he did so early in March last. Had Mr. Sewell's advice been carried out promptly by Mr. Murphy, instead of being delayed till June 13 before the opinion was formed by Mr. Murphy that such dressing machinery was necessary, the value of the property would have been tested in a legitimate manner, and instead of the company being 7000*l.* in debt Mr. Sewell's practical advice would have resulted, I believe, in good dividends to the shareholders.

When the mines were sold to the company the ores consisted chiefly of carbonates of lead containing silver, with some gold-bearing oxides of iron, and at that time the principle of the small blast furnace in use answered the purpose well enough for reduction, and promised good returns. The change in the character of the ore from the carbonates to sulphurets—a change, certainly, to be expected in such a stratification—should have altered the whole course of working, and the failure from that point shows clearly enough the want of intelligence that has marked the entire management.

The property is too good to be allowed to slip from the shareholders, and it remains with the shareholders at the meeting on Jan. 2 to support the raising of new capital by "a pull, a strong pull, and a pull altogether." Fredk. Bennett.

1, *New Broad-street, E.C., Dec. 24.*

THE UTAH MINE, AND ITS MANAGEMENT.

Sir,—Mr. Bateman, the vendor of the Utah property, said at the meeting on the 16th inst. that he had never sold a share (and he has several thousands), but that he "considered that thousands of dollars had been squandered away, and that the property was a good one was a settled fact." Now, I think it must be apparent to every shareholder from the facts that were elicited at the meeting respecting the bank's treatment, &c., at Utah, that there is a strong financial party who are determined to have the mine; it therefore behoves the Utah shareholders to be true to themselves, and prevent this. Debentures are a very good way of raising money, provided each present shareholder in Utah will take up his proportion of them; but if not, it is open to objection if a party advancing the money who at once has a command of the mine (this is sure, although, perhaps, not apparent, and will be so as long as human nature is constituted as it is; the manager of a mine knows where the power lies and acts accordingly, although he may appear to defer to the directors), and who will work it in such a way as to secure the mine to themselves. When this is accomplished we shall all then doubtless hear that it is a great success, but not till then. I think myself the best plan is the issue of fresh shares (say) at 1*l.* each, and then for each present shareholder to take his proportion *pro rata* allotment; this plan effectually prevents party action, and is fair to all.

Not to take up your valuable space too much, but to prove the truth of Mr. Bateman's assertions, I will refer you to Mr. Murphy's report (if this gentleman did write it). Page 14 he says, "Having proven practically that without dressing the ore never could be smelted with sufficient profit," &c.; and in p. 16 the cost of "Mr. Murphy's experiment was about 11,000*l.*, ending in failure." This, for a professed scientific smelter and miner, is a joke indeed. One would have thought that, with a person of Mr. Murphy's experience, the first view of the Utah ores would have suggested German jiggers; and I would suggest to my fellow-shareholders to ponder well Mr. Murphy's reply to that able smelter's (Mr. Bennett) questions to him at the meeting of the 16th inst. I considered Mr. Batters' statement at the meeting most straightforward and honest, and his views most practical and to the point as to present policy of working the Utah mines, and the one that should receive the support of all concerned, as he most justly remarked, "More within the scope of our knowledge, and more free from disaster and misery—the disaster and misery being incident on the character of individuals and the carrying on of a business so far distant from the base of operations in London." Most sound and honest statement; and, as Mr. Murphy in his report (p. 12) says, the profits will be equal, whether smelted in Utah or the ore sent to Liverpool, which I see he now recommends, we have plain sailing for the future; but I strongly recommend my fellow-shareholders to oppose Party either in Utah or England.

London, Dec. 23. A Utah Shareholder.

NORTH AMERICA GOLD MINING COMPANY.

Sir,—Since my last letter appeared in the Journal our directors have issued their report, and the first annual general meeting of the company has been held. The report announces the failure of the board to obtain the promised official quotation on the Stock Exchange, and also the retirement of Mr. Torrens, M.P., the Chairman of the company. These two facts are significant, and not calculated to allay the distrust which has long been felt in the value of the property and its management. That the attempt to obtain a quotation had fallen through was no secret, although our directors tried to keep it to themselves, but the announcement of our late Chairman's retirement from the board was unexpected, and has caused much surprise and disappointment. Under the circumstances it would have been satisfactory to the shareholders had he explained to them at the meeting (which he attended) on the 13th inst. the present position of the company, and whether he still entertained the same very favourable opinion of the mine and its prospects which he had expressed at the special general meeting of Dec. 4, 1871. At that meeting, which was held to consider the report of Mr. G. D. McLean, of Sweetland Creek, on the North America mines, our late Chairman, whilst deprecating as "unwise and uncandid" any exaggeration of their presumptive value, stated on behalf of the board that as men of business they believed the property would repay for the time and money they had devoted to carry on the enterprise to completion; that it had been before them for many months; and that whatever delusions might have existed at first had had time to be dissipated; that Mr. McLean's report had been before them for ten days, and that the directors were unanimous in submitting to the meeting for its adoption. The meeting appealed to in these persuasive and assuring terms, adopted Mr. McLean's report, and it was decided to purchase the property. Some explanation, therefore, was surely due to the shareholders from their late Chairman as to the present state of their property, instead of leaving them to suppose, owing to his withdrawal from the board that he had perhaps been deceived as to the real value, having found out that it possessed few, if any, of the good qualities and advantages a belief in which had led him to so strongly recommend it to the shareholders as a profitable investment. If he cannot be expected to tell them his private reasons for retiring from the board, he can, it is hoped, have no objection to inform them what, after a year's experience of it, he now thinks of a property into which, greatly on his recommendation, the shareholders put their money.

The directors in their report describe Mr. Morgan, the superintendent, as a "competent, zealous, and energetic" officer, but this, if correct, does not relieve him in the least of the responsibility of having written very favourable reports on the North American mines which have not been verified in any one important particular. We read therein of "a mine thoroughly opened," of "its great value proved," of "8 acres yielding $555,390," of "grains of gold the size of hempseed, 10 to 15 oz. pieces," and some, even "40 oz.," of one mine alone "yielding $37,700 in a month of 26 days," and "with proper management," we are promised 55,000*l.* to 60,000*l.* a year. When Mr. Morgan wrote this, and more to the same effect, he had worked in the mines for years, was, in fact, joint proprietor, and knew them thoroughly, and "no man" (as observed by an excellent authority, Mr. Pechy, at the recent meeting of Cedar Creek Mining Company) who has ever worked in a hydraulic mine, can possibly be deceived in estimating its value, if he does it honestly."

The report also tells us that the property, although unproductive hitherto, will, the directors believe, now "earn large and steady profits," and this belief, they think, is fully shared by the two shareholders who have lately visited the property; but these gentlemen have, since their return, been elected by the directors to seats at the board, and it is not to men in that position, or to any of the paid officials of a company, that one looks with confidence for a full and impartial statement of its affairs or a healthy criticism on its management, for, as has been seen at several recent meetings, it is to the unfortunate shareholders that we are indebted for the light which has been let in on the discreditable doings of boards and their employees, and which has destroyed public confidence in nearly all boards; that of North America not excepted, which has only published on short report from the mine since the meeting in Dec., 1871, and that report was as remarkable for raising false hopes, as the directors' letter accompanying it was for its studied omission of everything that was of real interest to the shareholders.

With respect to the promised "large and steady profits and substantial dividends," I fail to see whence they are to come. Mr. Morgan's account, made up to Aug. 15, 1872, and attached to the report, shows a profit of 1280*l.*, but if brought down, as it ought to have been, to Nov. 15, it would have shown a loss of 10,000*l.*; the very large sum of 9020*l.* having been remitted to him for expenses at the mine during those three months by our directors, thus sweeping away in that brief period the 10,000*l.* originally reserved for its development.

It may be that our directors will shortly declare a dividend out of the proceeds of the gravel accumulated at so heavy a cost at the mine during the last 12 months, but I venture to predict it will be the only one in 1873, and it is even not improbable that instead of receiving a second dividend the shareholders will have to provide Mr. Morgan with another sum of 9000*l.* to pay the expenses at the mine during the dry season from August to December next, for there is nothing more unlikely that anything but grevious disappointment and loss of money will accrue from his investment. A Shareholder in North America.

AUSTRALIAN UNITED MINES.

Sir,—The letter signed "Reader," in last week's Journal, omits one or two important particulars concerning the above valuable property, circumstances very favourable for the expected success of the adventure. In the Journal of June 15 it is stated "that the news from the Australian United Mines is of the most favourable character, and if justified by results the shareholders of the mine may yet be rewarded for their patience." In the Central Mine "the alluvial deposit (gold) is the richest in the district." It even exceeds those of Ballarat, and is likely to make good profits of a substantial nature.

Again, on Aug. 17, 1872, in the same periodical, it is stated that "a few months ago the shares were largely dealt in at 3*l.* to 3*l.* 10s., when the prospects of the mine were not nearly so brilliant as at the present time, for the future of this adventure is beyond any sanguine calculations." At what quotation ought these shares to stand at this moment on the market? About 31,000 shares are on the register at the present time, including the last issue at 10s. per share. The price ought to be 2*l.* 5s. to 2*l.* 10s., supposing the prospects to be no better than at that time. Of course, there were but 20,000 shares when the highest price was quoted, and business frequently transacted. Few speculations equal this mine at 15s. (say), or with 31,000 shares in round numbers, 23,000*l.* for the purchase of this neglected Australian valuable property. Shareholder.

[For remainder of Original Correspondence see to-day's Journal.]

Immense Ore Deposits.—Some months ago we made a report on the Richmond Consolidated, in the columns of the *Sentinel*, in which we mentioned the body of ore there as immense. Yesterday, by an order from the District Court, a party of gentlemen, including the superintendents of both the Eureka and Richmond, went through and inspected the new workings. The sight exposed is one beyond description: in fact, the enormous quantities of ores in sight make one stand dumbfounded and amazed. And the strangest feature in the case is that the workings have been carried completely through the ground known as the "Look

Out," which location belongs to the Eureka Consolidated, and has hitherto been considered of but little value. After a thorough inspection of the various shafts, drifts, and inclines, the whole party were prepared to say that no such immense bodies of ore had ever been seen in Eastern Nevada, and perhaps in the world. In one place superintendent Fisher exhibited a body of ore, which by actual measurement, would aggregate 40,000 tons of ore in sight, which at a value of $60, would show the large sum of $2,400,000. This in connection with the late strike at the Phœnix, will cause Eureka stocks to look up again, and place this really meritorious district where she properly belongs—in the front rank.—*Eureka Sentinel.*

FOREIGN MINING AND METALLURGY.

A slight revival is noted at Paris in copper. Corocoro minerals have risen 1*l.* per ton; Chilian in bars, delivered at Havre, has brought 89*l.* per ton; ditto, ingots, 94*l.* per ton; ditto, tough English, 93*l.* per ton; and Corocoro minerals, 91*l.* per ton. Business in copper has been quiet at Marseilles, without any sensible variation in prices. In Germany the state of affairs has slightly improved, and business is in a tolerably satisfactory condition, having regard to the period of the year. At Berlin transactions have been quiet, and are confined to some purchases made to meet the requirements of local consumption. Some rather important transactions have taken place in tin in Holland, and the market has sensibly hardened. Billeton has been quoted at 82 fl., and Banca at 86 fl. to 86½ fl. At Paris, Banca tin has risen to 154*l.*, and Straits to 142*l.* per ton. The German tin markets have been in a somewhat colourless state. French lead, delivered at Paris, has risen to 22*l.* 12s. per ton; Spanish and English, delivered at Havre, to 22*l.* 6s. per ton; and Belgian and German, delivered at Paris, to 22*l.* 16s. per ton. The Cologne lead markets have remained without any appreciable change; and the same may be said of the Hamburg lead trade. At Paris zinc remains firm at former rates—that is, at 24*l.* 16s. per ton for Silesian, while other good marks have realised 24*l.* 14s. per ton. The German zinc markets have preserved a tolerably satisfactory tone, and prices have been generally well sustained.

The revival in the iron trade in England has communicated rather more firmness to prices in Belgium. The market for rails especially displays increased activity; some rather considerable transactions are in course of negociation, but nothing definite has yet transpired respecting them. The considerable difference between Belgian and English prices may exert an important influence upon the conclusion or non-conclusion of these contracts. Pig remains scarce and dear; merchants' iron maintains its quotations. The shares of industrial companies have shown some little weakness at Brussels during the last few days.

In France, iron still maintains its price pretty well, notwithstanding the partial stagnation in affairs, and the appearance of English pig upon the French markets at lower rates than those current for French pig. Rolled coke-made iron has slightly fallen; some rather numerous transactions have taken place at 13*l.* 12s. per ton. Charcoal-made iron has brought 15*l.* to 15*l.* 8s. per ton; charcoal-made sheets, 16*l.* 8s. to 17*l.* 4s. per ton; and ditto coke-made, 15*l.* 12s. to 16*l.* per ton. From all sides, but especially from the South of France, complaints are heard as to a great want of coal and coke, the result of floods and a scarcity of railway plant. Unfortunately, there is no immediate prospect of any improvement, as winter frosts will probably check arrivals by boats, and so increase the difficulty experienced in obtaining supplies of combustibles. The Vienna Metallurgical Company will pay on Jan. 1 an interim dividend of 16s. per share 18*l.* paid, and 4s. 6d. per share 5*l.* paid.

The French coal trade appears to grow rather weaker from day to day, especially as regards coal for domestic purposes, the stocks of which are now sufficient to provide for requirements reduced by the exceptional and unnatural mildness of the season. Coalowners show little disposition to submit to a fall in prices, which will, nevertheless, be imposed upon them by circumstances as regards some rather important contracts which have to be executed during the approaching season. One of the French railway companies is stated to have concluded a contract for 50,000 tons of agglomerates, at 19s. 2d. per ton. Coal for industrial purposes continues in considerable demand, and maintains its price better than other descriptions.

Industrial and steam coal remains firm upon the Belgian markets, but other qualities of coal reflect the influences of the mildness of the season. Contracts for steam coal are stated to have been concluded for the first six months of next year at 1*l.* 0s. 10d. per ton. Belgian industry is acquiring every day a further development—a development which promises a brilliant future to the Belgian coal trade, already in a prosperous condition. Two important industrial undertakings have been established this month in Belgium—the Fleurus Sugarworks Company and the Charleroi Glassworks Company; M. Charles Lebeau, Burgomaster and Senator for Charleroi, presides over these two companies. It is reported that an important establishment is about to be created in the Charleroi basin for the development of the Danks' system. A great financial firm will, it is stated, extend its co-operation to the new company. Official approval has been given to the establishment of the Strépy-Bracquegnies Collieries, Blast Furnaces, and Ironworks Company. The Sars-Longchamps and Bourg Collieries Company will pay on Jan. 2 interest for 1872 at the rate of 2*l.* per share. The Crachet and Picquery Collieries Company will pay on Jan. 2 a first dividend for 1872 at the rate of 5 per cent. per annum.

THE CARIBOU MINE AND REDUCTION WORKS.

Four miles from Caribou, and 1200 ft. lower at the junction of the roads diverging to the four points of the compass, this embryo city is rounding into form. A beautiful sheet of water, the Middle Boulder, flows by on the south, and pine-clad mountains rise grandly around it; a few miles below is Boulder canon, where Nature has hung one of her most sublime pictures. A great quartz-mill and a little saw-mill are humming to the tune of busy and profitable lives. The hotel, the post-office, and the two stores, together with two or three boarding-houses, a blacksmiths' shop, and 15 or 20 dwellings and other buildings, besides the mills, is the aggregate of the town.

THE CARIBOU SILVER REDUCTION WORKS are the making of this rising little burg. The external dimensions of this great mill are 100 by 165 ft. There are five terraces or floors devoted to as many different degrees in the treatment of ores. The first, or upper floor, upon which rests a Blake crusher, is the ore-room, where the wagons deposit the silver rock. It is then passed through the crusher and into the dry kiln. From the kiln it goes into the 15-stamp battery, and is there ground to powder beneath ponderous iron pestles, weighing 750 lbs. each, dropping 8½ in., and 100 times per minute. After leaving the battery it passes through a No. 40 wire sieve, or bolt cloth, and by conveyers to the hoppers resting over the Bruckner furnaces awaiting to receive the glittering dust. These great cylindrical furnaces have a capacity of 2 tons each every eight hours, or 1 ton for each of the 24 hours. From the furnace it falls red-hot into an iron car resting on iron rails beneath, and at each round a charge from a single furnace, until the four are empty. It is then wheeled a few feet, and dumped and spread on the cooling-floor, where it is wet down, or sprinkled with water, as we do dusty streets, and left to become cool. In the amalgamation pans the dusty treasure next finds a lodgment. These pans are 10 in number, each with a capacity 1000 lbs. to the charge. In the pans quicksilver is introduced, which collects to itself the genuine silver, after which it is drawn off and strained, thus separating and saving both. The remaining contents of the pan are then let into five settlers, that catch any particles of silver or quicksilver that may have escaped the pans; and, to guard against accidents, in the basement are two agitators, each of which receives separately the entire contents of the five settlers through which the base material passes on its way to the creek. Thus it will be seen no loss can be sustained. The superintendent, Prof. J. M. Dawley, offers $100 per ton for every ton of the material after it leaves the agitators that will assay $7. After the amalgam is taken from the pans and strained it is submitted to a retort, when the remainder of the quick is sublimed or vaporised, and the silver then becomes crude bullion. It is next submitted to plumbago crucibles and placed in the melting furnace, where it becomes molten silver, after which it is poured into cast-iron moulds, brick shape; out of them comes those famous silver bricks weighing from 1800 to 2000 ozs. each. These bricks are then taken to the assay office, and there assayed and marked, which renders them ready for shipment: 850 fine is their usual average, but some lots run as high as 950. These works are styled the old Freiberg process of calcining and amalgamating. The mill is built on the Nevada style, and in all its details for treating these ores it is as near perfect as such works can well be made. All this extensive and ponderous machinery is driven by an engine of 150-horse power. From 8 to 12 per cent. of salt is used, or about 3500 lbs. every 24 hours. The labour of 20 men is required in and about the mill to keep it in operation day and night. On the mill and mine $3000 per month are expended, and 130 men, including contractors, find employment. J. M. Dawley, of Nevada, one of the most skilful assayers, metallurgists, and millmen on the Pacific slope, has charge of the assay-office and the entire mill, and is likewise driving the tunnel at the mine. The coming year it is designed to double the capacity of the mill, thereby giving employment to a greatly increased number of men, and add another fraction to the bullion product of the world.

The thriving town of Caribou, of 100 or more houses, is situated 9500 feet above the level of the sea. Its first settlement was in May, 1870, when the celebrated silver mines hereabouts were first discovered. The place is accessible by good roads that span the country between here and the older towns and the mining district extending to the southern border of Colorado. Down the Middle Boulder, through canons and gorges, whose mural sides rise like frowning battlements, an important thoroughfare has been established to Boulder City, a distance of 20 miles, over which four-horse hacks and a mail perform tri-weekly service.

THE CARIBOU MINE.—The grandest enterprise of this gold and silver region is the great Caribou Mine, located about 800 yards west of the town, at an altitude of about 10,000 feet above tide water. It is universally conceded by experienced miners to be the richest and best paying silver mine, in proportion to its development, of which we have any record. On the surface it extends 1400 linear feet, for which a Government title has been obtained. There are 11 shafts, aggregating over 1000 feet, the deepest of which is 290 feet from the surface. The mine contains 10 levels, aggregating not far from 1300 feet, width of crevice from 7 feet to 9 feet, with smooth and well-defined walls. This extraordinary silver ledge is embedded in a mountain of syenite, but the vein is so perfect that mining operations are carried on at a rapid rate; and as the ores contain a large percentage of sulphurets and galena, carrying tons of silver glance and brittle silver, with very little zinc-blende, and no antimony or arsenic of any consequence, they are rendered exceedingly easy of reduction, while their richness is almost fabulous. Parties offer to wager that a ton of ore can be obtained from this mine that will yield $10,000—coin value. Two selected specimens, recently assayed by Prof. Dawley, gave as follows:—One at the rate of $26,301·60, and the other $29,797·40 per ton of ore. Along some of the principal levels, and at the bottom of the main shaft, the ore is so loaded with native silver that large bodies of it will yield in bullion from $1000 to $10,000 per ton. A better timbered and a more systematically conducted mine is not to be found; it is as complete in all its details as a great mine can well be. Over the main shaft stands a whim-house, 32 by 130 feet, a 15-horse power engine, a blacksmiths' shop and other useful apartments, all under this one roof. East of the main shaft another whim-house, 32 by 60 feet, has been built, where the ore is hoisted by horse-power from a depth of 170 feet below the surface. West, again, two more houses are being erected, each 32 by 65 feet, for hoisting ore from shafts Nos. 5, 6, and 7. Near the base of the Caribou hill, on the east, a tunnel is being driven for the purpose of thoroughly draining the Caribou Mine, and to facilitate the handling of ore from the main shaft to the mouth of the tunnel. The distance on the surface is 1058 feet, the length of the tunnel to the main shaft will be 840 ft., and its terminus will be 420 feet beneath the surface; 192 feet are already completed, and nine men are crowding the work night and day. It will cut 15 or 20 rich lodes, and drain several valuable mines besides the Caribou. The coming winter will witness its completion, and render more valuable the tributary mines that surround. A total of 84 men are now at work on the tunnel and the great mine it is to penetrate, and the company propose to double that number when the tunnel is completed. The roads and all the various interests pertaining to this mine are in the best possible condition, and the employees seem to take as deep an interest in the enterprise as the owners themselves. The vein broadens and increases in richness as the work of development goes on: and, taking the present indications as a criterion, the mine within the next five years will prove equal, if not superior, to any silver mine in the world. The ore at present yields at the mill an average of $200 per ton, and the capacity of the mill is 20 tons per day, but it is the company's intention to enlarge their works so as to enable them to take out and reduce ore that will produce $10,000 worth of bullion every day.—*Rocky Mountain News.*

CAMP FLOYD MINING DISTRICT.

We present to our readers a map of Camp Floyd mining district, Utah territory, surveyed and drawn expressly for us by B. A. M. Froiseth, of the Surveyor-General's office, Salt Lake City, author of "Froiseth's New Mining and Sectional Maps of Utah." The map shows the United States surveys by township and sectional lines adjoining the district, the town site of Lewiston and the numerous mines on either side of it, the roads to Ophir over the divide, to Salt Lake City by Rush Valley, and to Fairfield, or old Camp Floyd; also the settlements of Cedar Fort, and Fairfield and Cedar Valley, and quartz mill of the Camp Floyd Silver Mining Company. This will be a valuable map for all parties who are interested in mining in that region. We have also been furnished by Col. Froiseth with a description of the district and the principal mines, which is as follows:—Camp Floyd is situate in Tooele and Utah counties, and was organised about two years ago. It is distant from Salt Lake City 55 miles, and is accessible from it by two routes of travel, one a daily line of fine stages, run by Wines and Kimball, *via* Ophir, Stockton, and Rush Valley, and the other by rail to Lehi, thence by stage by way of Fairfield. The district created little or or no excitement for the first year, until the development of the Sparrow Hawk Mine, which at once proved the richness of the district, and since that time it has been steadily improving as other mines have been further developed, and it is now considered one of the best districts in the country for milling ores. Its value has been greatly enhanced by the erection of—

THE CAMP FLOYD SILVER COMPANY'S MILL, built under the supervision of the energetic manager, Captain E. H. Shaw. This mill is one of the most complete in the country, contains 20 stamps, and is now capable of reducing 30 tons of ore daily, but with its capacity for 30 stamps it will probably be soon reducing a much larger quantity. A tramway for the transportation of the ore from the mines to the mill has been built and is now in full running order.

THE MINES.—The English Company's mines, the Sparrow Hawk, Last Chance, and Marion, have been actively worked all the summer. From 40 to 50 men are now constantly engaged in taking out the ore to supply the mill, which is running night and day. The Mormon Chief and its extension the Grecian Bend, and the London, consists of 3000 linear feet along the lode by 400 in width, beginning at the upper end of the Camp Floyd mines, and running westerly along the line of croppings. The developments in tunnels, in cuts, shafts, drifts, and inclines, will measure about 500 feet, showing a large body of free milling ore. The Camp Douglas is developing finely, and large bodies of antimonial silver have been struck about 25 feet down the shaft, running in an easterly and westerly direction. The shaft has been continued to a depth of 47 feet, where the footwall was struck, passing through a fine body of vein matter the entire depth. From this point a drift has been commenced, which is now several feet long. The Gen. Morrow, owned by the same company, is down 53 feet, and is very promising. The Antelope has now a shaft 7 by 7 and 13 feet deep, and an open cut some 200 feet from the shaft, 6 feet wide and 10 feet in. The ore from this mine is of good quality, as a recent assay of quartz went $362·70 to the ton, and equally good results are anticipated as the work of development goes on.

THE SILVER CLOUD has a shaft 55 ft. deep, cutting a vein of ore at a depth of 55 ft. A level has been driven 180 ft. on the course of the vein from the bottom of the shaft, showing a vein of 12 ft. of rich milling ore, assaying from $50 to $2000 per ton. A tunnel has also been run 275 ft. to cut the vein 200 ft. below the face of the shaft. A mill site has been located adjoining the mine, upon which is a fine spring of water. The Star of the West, owned and worked by a New York company, Joseph Rau president, is taking out a large quantity of ore of very good quality. This mine is very promising and will soon pay a handsome dividend to the owners. The Silver Circle and Wandering Boy have a large number of men employed and are developing well. The Peerless, Bismarck, Elk Horn, Red Eagle, and Silver Star are good mines and in a flourishing condition. Several mines have been sold during the past season to New York and San Francisco capitalists, who have incorporated stock companies, and who are now busily engaged in developing their property.—*Mining and Scientific Press (San Francisco)*, Nov. 30.

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—Return for three weeks: Copper made since last report, 14 tons 17 cwts. 3 qrs.; copper dispatched, 12 tons 17 cwts. 3 qrs.; copper on hand, 7 tons; regulus on hand, equal to 4 tons.

PORT PHILLIP AND COLONIAL (Gold).—Clunes, Nov. 6: The quantity of quartz crushed during the four weeks ending Oct. 9 was 5377 tons; pyrites treated, about 30 tons; total gold obtained, 1153 ozs. 7 dwts., or an average per ton of 4 dwts. 7 grs. The receipts were 445*l.* 19s. 3d.; payments, 397*l.* 11s. 6d.; profit, 47*l.* 7s. 9d., to which was added last month's balance of 71*l.* 17s. 6 l., making a total of 119*l.* 5s. 3d. The amount divided between the two companies was 100*l.*, of which the Port Phillip Company's proportion is 65*l.*, the balance of 19*l.* 5s. 3d. being carried forward to next month's account. Remittance, 50*l.*

YORKE PENINSULA.—The directors have advices from the Committee of Inspection at Adelaide, dated Nov. 1, with reports from the Kurilla to the same date. Capt. Anthony reports:—"At the 15, west of Deeble's shaft, driving by four men, the lode is small, but not destitute of ore. I have continued to drive on the lode at the 25, west of Deeble's shaft, where a great improvement has taken place; it is fully 4 feet wide, and yielding rich stones of bell-metal ore, besides being in every way a fine lode, except that we are not deep enough to realise large returns of ore although even now it is a paying lode, were the means at hand to properly lay it open by driving and sinking, and with crusher and jiggers for dressing. I have on hand, dressed and undressed, about 40 tons of ore. I did hope to be able to begin working our ground below the 25, west of Deeble's, by the returns from tribute ground and independently of other sources. This, however, has failed me owing to the tributer's having been drawn away to the many new mining enterprises set on foot in the other colonies, as stated in my reports of the last two months. I hope still to resume tribute works when our miners return from Queensland, and thereby to very materially assist in carrying out this necessary dead work. I shall sell about 25 tons of ore in a few days. The engine and pit-work are working satisfactorily. The committee add that the miners are now finding their way back by degrees.

AUSTRALIAN UNITED (Gold).—Mr. Kitto (Nov. 6) writes:—"Owing to the fact of our 14-in. drawing lift being a heavy drag on the engine at the Central Mine, a very large consumption of fuel was induced, and delays often caused by changing buckets, so I determined, having the pipes on the ground, to take out the 14 in. drawing-lift, and fix a 10-in. plunger. This work (although entailing a loss of five days) has been successfully performed, and already there is a marked saving of firewood. I shall advertise the spare lift for sale; it ought to realise 200*l.* Regarding the mine, I may state that our prospects were never brighter, and now regularity is established in pumping, I hope shortly to send you another 500*l.*" Mr. Lamb further wrote, on Nov. 7: "Although several days have been lost this month through alterations and overhauling the machinery at the mine, yet the yield has been very good, and promises to be steady and continuous; and, from the improvement effected by the alterations, the cost in fuel and labour should be materially lessened, and a larger amount of wash-dirt should be raised. Enclosed, please find a statement of receipts and expenditure for the past month, by which you will see the yield of gold has amounted to 86*l.* 11s. 5d. for 18 days only; so that if we had washed the full month my anticipations last mail of the yield of gold being doubled this month would have been realised; as it is, it is not far short of it. I came to Melbourne the day before yesterday, and requested the captain to wire me the gold yield for the past three days. He has not done so up to the last moment of posting, so that only 18 days' yield is in the balance sheet."

ENGLISH AND AUSTRALIAN (Copper).—Port Adelaide, Nov. 4: The operations of the company were proceeding satisfactorily. There were three smelting, two roasting, and one refining furnace at work at the Park Works. Since date of last advices 135 tons of copper had been shipped.

SCOTTISH AUSTRALIAN.—The directors have advices from Sydney, dated Nov. 4, with reports from the Lambton Colliery to Oct. 28. The sales of coal for October amounted to 16,321 tons.

ANGLO-AUSTRALIAN (Gold).—Mr. Kitto (Nov. 6) writes: "I have drawn against your letter and credit No. 17 (1000*l.*), and forwarded my draft in the usual way, through the Bank of Victoria, for collection. Sinking has been resumed in the eastern engine shaft, and three small parties of tributors are working in various portions of the shallow ground, and obtain a little gold." Mr. Lamb further writes: "Sinking is going on in the eastern engine-shaft and in the winze in the cross cut in the western shaft, this being all we dare do in our pecuniary position. Some parties of tributors are still at work on the mine. By the enclosed statement you will see the amount of gold received by the company from the tributors since last mail (106*l.* 8s. 6d.). When we cross-cut from the engine shaft we expect to be in very good country for gold, but it is a great pity we are not enabled to carry on the whole of the works at once with despatch." [The company have remitted out 200*l.* since Mr. Lamb wrote the above.]

THE BURRA MINE—NEW STAMPS—NEW DRESSING MACHINERY.—The South Australian Mining Association half-yearly report is more satisfactory in its promise for the future than in its records of the past. The accounts are, as usual, finally made up only to March 31, and upon the operations of the year ending to that date there is a slight apparent loss. The total charges of the year were 13,922*l.* 14s. 8d., as against 13,570*l.* 18s. 4d., realised from ore raised, rents and interest received, &c. It must not be overlooked, however, that these charges embraced not only the ordinary cost of working, but also the expense of experimenting in the new processes adopted, and of erecting new machinery, the beneficial results of which have yet to be felt. It is, doubtless, partly owing to the improvements thus effected, as well as to the rise in the price of copper, that the directors felt able to declare a dividend a short time ago. Of actual returns to be looked for in the future the report is judiciously silent, but as to the extension of the operations gradually clears away the accumulated debris on the surface, and gives more and more ready access to the old workings of the mine, it may fairly be hoped that improved results will follow. Some indication of this may be gathered from the fact that while in the year ending March 31 the quantity of ore raised was only 1058 tons, the quantity raised in the six months ending on the 30th of last month was 1269 tons, averaging 17½ per cent. of copper. In a few days the directors expect to have got the water forked to the 50 fm. level, and thus to be able to let several pitches at Peacock's 40 fm. level, from which very good results are anticipated. Among the new appliances recently introduced mention is made of a set of stamps of 15 heads, which is expected to assist considerably in increasing the yield. We are pleased also to observe the high tribute paid the efficiency of a dressing-machine of South Australian invention.

An expensive machine was some time ago erected on the recommendation of the engineer who was sent out specially from England to report upon the mine, but it does not appear to have yielded very satisfactory results. Accordingly, as we gather from the report:—"In April last Captain Paull was instructed to visit the Moonta Mine, in order to inspect and report upon Captain Hancock's dressing machine in use there, and which has been attended with signal success on the Moonta and neighbouring mines. The report was so favourable, both as to efficiency and economy of construction, that it was resolved to make a trial of a similar machine on the Burra Mine. The experiment has fully maintained the reputation of the machine, which has proved not only capable of dressing the Burro ores, but of doing so in a more expeditious, efficient, and economical manner than any other plan yet adopted. The creeksand being exceptionally difficult to deal with, doubts were entertained whether the machine could be made available in treating this class of ore; but a trial just completed has shown that with a few inexpensive alterations it is well adapted for the purpose, and effects a more thorough and speedy cleansing of the ore than any process hitherto tried."

We believe that Capt. Hancock grants the use of his patent upon very liberal terms, and we are glad to have this opportunity of drawing public attention to its apparent value. We are assured that its use is by no means limited to copper ores, but that by a slight adaptation of its arrangements it will cheaply and efficiently separate any ore from the waste, provided the former has a higher specific gravity than the latter. A gentleman who has carefully studied the working of the machine informs us that he deems it a great a boon to the miner as Ridley's reaper was to the farmer. The latest reports from the mine state that the works are proceeding with much vigour, but an accident which happened to the plunger-pole of the large engine last week retarded all excavating and dressing operations for want of water during five or six days. The water is now forked to the 50 fm. level, and the miners will soon be in full work there.—*South Australian Register.*

FOREIGN MINES.

EMMA (Silver).—Telegram: Lake City, Dec. 23: Raised 810 tons of first-class ore this week; 440 tons of first-class ore at railway depôt; 230 tons of first-class ore at the mine: 550 tons sold here; 380 tons of first-class ore advised as raised in last telegram should have been 230 tons; 520 tons at mine should have been 370 tons.

FLAGSTAFF.—Mr. Maxwell, Dec. 4: The ore in the shaft is now 10 ft. wide, and improving. I telegraphed you as follows:—"Cut good ore at the shaft" (published Dec. 10). This ore assays better than any we have yet seen in the mine in silver and gold, but there is only 28 per cent. of lead in it at present. I believe it will improve in richness in depth. We are sinking the shaft and driving the deep level with all possible speed, and the general condition and prospects of the mine are more favourable than they have been at any other time. The bottom of the shaft should now be about 600 ft. from the surface.

COLORADO TERRIBLE LODE.—The following voucher accompanied the agent's letter, of Nov. 12:—"Office of Stewart's Silver Reducing Company, Georgetown, Colorado, Nov. 1: 49 tons 577 lbs. of second-class ore from the Terrible Mine—assay, 119½ ozs. per ton; price, $106·37½, equal to $5243·05.—J. OSCAR STEWART, Superintendent." Monthly Statement: Ore raised during October: 1st class, 5 tons, value per ton $450, equal to $2250; 2d class, 50 tons, value per ton $20, equal $3600; 3d class, 50 tons, value per ton $20, equal to $1000: total, $6850. Month's Expenses: Management, $280; mining and labour, $5384·65; teamsters and interest, $762·40: supplies and sundries, $605·63: total, $7032·68.

[For remainder of Foreign Mines see to-day's Journal.]

EXCHEQUER.—In a few days the carpenters will be transferred from the I. X. L. and Exchequer Mines to the Exchequer mills. Vigorous work will be instituted for the completion of quartz mill. The blacksmiths' shop is to be removed and on its site is to be erected a 90-ft. ore-house, to be connected with the mill by a tramway about 150 ft. in length, the elevation allowing the highest loaded teams to pass under it. The boarding-house is to be removed to another site to make room for a double extension of the sawmill; the rear of the mill is to be excavated and the back of the creek walled for an immense basin to hold tailings; the flume is to be extended to a point where an additional fall of 12 ft. will be obtained; another turbine is to be added, giving a 200-horse power exclusive of the engine.——I. X. L. MINERS.—The miners for this mine are to come from Grass Valley—a good place to procure men.—*Alpine Chronicle*, Nov. 30.

INDIAN COAL.—At the Great Indian Peninsula meeting, Mr. Wilde said that the Nerbudda Coal Company had expended 100,000*l.* 14 years ago on their mines, and they were anxious now to have some return on their unproductive capital. During the past six months they had delivered 6000 tons of coal to the railway company. The coal from England cost 35s. per ton at Bombay, while that supplied by the Nerbudda Company was 18s. per ton; there was a margin between the two prices that might admit of the coal company having a profit. The Chairman stated that the coal company had contracted to supply 300 tons of coal per week to the railway company for the past three years, or 35,000 tons, but they had only supplied 11,635 tons, or 100 tons per week. So long as it was the interest of the company to take the coal they would use it.

MINING IN INDIA.—The coming year promises well for commercial enterprise in India. A company, with a nominal capital of 1,100,000*l.*, has been formed in London for working the rich veins of silver in the Valley of Kulu, in the north-east corner of the Punjaub. The directors, among whose names appear those of several old Indians, guarantee a dividend of 8 per cent., so that they, at all events, are sanguine as to the profitable results of the undertaking. These Kulu silver mines, if the accounts of them are to be believed, rival, if they do not exceed, in value the celebrated ones of Potosi, that El Dorado of the early Spanish settlers in Peru. In a few weeks the quiet little station of Sultanpore will be enlivened with the din and bustle of smelting works. In the second place, a Mr. H. Bauerman, who lately arrived from England, is reported to have been deputed by the Secretary of State to visit the chief iron mines here, with a view of ascertaining the practicability of working them. We presume the coal formations will not be neglected. If this gentleman, as we suppose, is to visit every locality where these have been found in any considerable quantity, we trust that Government will associate with him one or more gentlemen practically acquainted with mining operations. There has been in our searches after minerals in India a great deal too much dependence on geology, and little or none on practical experience. We trust that Mr. Bauerman will not confine his investigations to localities in settled districts, bearing in mind that wire tramways can be carried through the most difficult country, so that now no deposits can be considered unworkable for want of communications.—*Indian Statesman*, Dec. 2.

THE DIAMOND SWINDLE, AND CALIFORNIA MINES.—One cannot help but speculate upon the result that the late diamond swindle will have abroad upon certain American mining properties that are now before capitalists in Europe, inviting their attention and co-operation, for the purpose of opening up new mines of wealth and profit on this coast. A burnt child dreads fire, and our English friends have been sufficiently scorched during the past ten years by unprincipled men from this country to suggest the propriety of their keeping aloof from a community where even the brightest of mining experts or engineers, and most wide-awake business men, are deceived and swindled. Our State never was truer to capital and honest labour than at the present time. We have more breadstuff than we know what to do with. Our gravel mines are turning out larger amounts of gold than ever, and yet they are scarcely touched. Our gold quartz mines are increasing in number, and the old mines in richness as they gain in depth. Our silver deposits west of the Rocky Mountains need no praise; they speak for themselves. Let good and honest men be sent here to represent capital from abroad, and we shall have millions of European capital rolling in to gather profit from these shores. Although California proper cannot lay claim to any great amount of silver wealth, the near future promises great developments in that line. The silver belt of this continent crosses the lower part of this State, where the country is unsettled, and until lately (on account of Indians) unsafe; besides, the facilities for reaching the same, and the conveniences for prospecting, have not been so attractive as on the belt further north and east. Yet the southern part of California is being gradually brought into notice as a rich silver country. The ores received in this city from "Ivanpah," "Iverwatts," "New York," "Douglass," "Blackhawk," and other new districts (all in California) prove the mineral deposits there to be of great richness. Inyo county has furnished, and still continues to furnish, hundreds of bars of bullion monthly, and this is in our State. Catalina Island will undoubtedly soon swing into line as a silver-producing property, and, if present indications are any criterion, in no small quantity. There are a number of men at work on this island, taking out ore from what is known as the Middle Hill claim, and it is said the quantity and quality of ore exposed more than warrants what has been sold of this valuable estate. Sixty tons of the ore from this "Island of Silver," sent to this city at a total cost of less than $15 per ton, works over $150 in silver alone, the gold and lead not being considered. The island is in California, and is owned by Mr. James Lick, of this city. It needs no expert to speak for it, the results, from actual and practical workings, proving it to be a second "Comstock," that will give employment to thousands of miners ere long. We lay no claim to diamonds now, but of gold and silver we have plenty, and invite the world to come and share it with us.—*San Francisco News Letter*, Nov. 30.

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AND 115, GRESHAM HOUSE, E.C.
MANUFACTURERS OF
PUMPING and other LAND ENGINES and MARINE STEAM ENGINES the largest kind in use, SUGAR MACHINERY, MILLWORK, MINING MACHINERY, and MACHINERY IN GENERAL.
SHIPBUILDERS IN WOOD AND IRON.

SECONDHAND MINING MACHINERY FOR SALE,
IN FIRST-RATE CONDITION, AT MODERATE PRICES.
PUMPING ENGINES, WINDING ENGINES; STAMPING ENGINES STEAM CAPSTANS; and CRUSHERS of various sizes. BOILERS, PITWORK of all descriptions, and all kinds of MATERIALS required for MINING PURPOSES.
THE PATENT PNEUMATIC STAMPS
May be SEEN AT WORK at HAYLE FOUNDRY WHARF, NINE ELMS, by previous application at either of the above addresses.

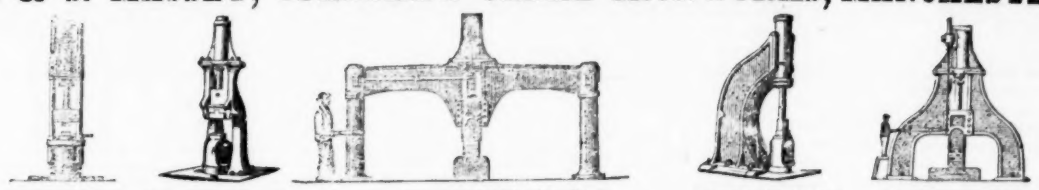
CAPTAIN TREGAY'S
IMPROVED  **PATENT**
STAMP COFFER,
FOR STAMPING GOLD QUARTZ, TIN, AND OTHER ORES
The grateway is extended, discharge doubly increased, and power economised.
May be inspected in full work, on application to Captain TREGAY, Redruth, Cornwall, who is PREPARED to TREAT for GRANTING LICENSES for its use, or to SUPPLY the MACHINES.

J. WOOD ASTON AND CO., STOURBRIDGE
(WORKS AND OFFICES ADJOINING CRADLEY STATION),
Manufacturers of
CRANE, INCLINE, AND PIT CHAINS,
Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES and FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.
Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions.
STOURBRIDGE FIRE BRICKS AND CLAY.

BOLTS AND NUTS. BOLTS AND NUTS.
MADE BY PATENT MACHINERY.
Suitable for Engineers, Millwrights, Coach and Wagon Builders, Colliery, and other Purposes.
AN EXTENSINE ASSORTMENT OF OVER 200 TONS ALWAYS IN STOCK.
From which orders can be promptly executed. Every description of Bolts and Nuts made to order.
BAR IRON. BAR IRON.
OVER 1000 TONS OF BARS, PLATES, SHEETS, ANGLES, HOOPS, SQUARES, ROUNDS, AND FLATS.
All of First-class Quality.
RAILWAY, COLLIERY, AND TRAM RAILS, TO ANY SECTION.
A large Stock of Anvils, Vices, Tue Irons, Smiths' Bellows, Files, Rasps, Picks, Spades and Shovels, Sledge and Hand Hammers, Best Swedish Horse Nails, Back Bands, Plough Traces, Best Spring, Cast, Double Shear, and Blister Steel.
STANSFELD & SONS, Iron Merchants, Bolt and Nut Manufacturers,
ALFRED STREET, BOAR LANE, LEEDS.

FRANCIS MORTON & CO., LIMITED, LIVERPOOL,
Manufacture, in Galvanised and Corrugated Iron,
IRON ROOFS, IRON BUILDINGS, IRON SHEDS,
Which they have extensively supplied and erected for mining requirements at home and abroad.
ESTIMATES FURNISHED ON RECEIPT OF PARTICULARS.
F. M. & CO.'S PATENT IRON ROOFING TILES OR SLATES ARE IN SPECIAL FAVOUR FOR TEMPORARY COVERING,
They require considerably less framework to carry them than ordinary slates or tiles.
ILLUSTRATED CATALOGUE ON APPLICATION.
London Office, 36, PARLIAMENT STREET, S.W.

PRIZE MEDALS—PARIS, 1867; HAVRE, 1868; HIGHLAND SOCIETY, 1870.
B. & S. MASSEY, OPENSHAW CANAL IRONWORKS, MANCHESTER.



Special Steam Stamp. Hammer for General Smith Work, &c. Hammer for Wheel-making, Copper Work, &c. Hammer for General Smith Work, &c. Hammer for Heavy Forgings.

PATENTEES AND MAKERS OF DOUBLE AND SINGLE-ACTING **STEAM HAMMERS** of all sizes, from 17 lbs. to 10 tons, with Self-acting or Hand Motions, in either case giving a perfectly DEAD-BLOW, while the former may be worked by hand when desired. Large Hammers, with Improved Framing, in Cast or Wrought Iron. Small Hammers working up to 500 blows per minute, in some cases being worked by the foot of the smith, and not requiring any separate driver.
SPECIAL STEAM STAMPS, of great importance for Smith Work, Bolt-making, Punching, Bending, &c.
Hammers for Engineers, Machinists, Shipbuilders, Steel Tilters, Millwrights, Coppersmiths, Railway Carriage and Wagon Builders, Colliery Proprietors, Ship Smiths, Bolt Makers, Cutlers, File Makers, Spindle and Flyer Makers, Spade Makers, Locomotive and other Wheel Makers, &c.; also for use in Repairing Smithies of Mills and Works of all kinds, for Straightening Bars, Bending Cranks, Breaking Pig-iron, &c.
STEAM HAMMERS AND STEAM STAMPS MAY ALWAYS BE SEEN AT WORK.

THE DON ECONOMIC LUBRICATING OIL
IS 40 PER CENT. CHEAPER THAN THE ORDINARY KINDS.

MR. ALFRED HEWLETT, of the Wigan Coal and Iron Company, says:—"I have used it for two years, and find it to answer exceedingly well for lubricating purposes."

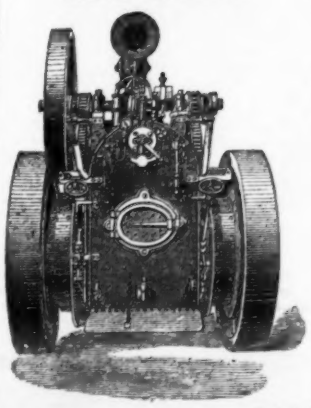
MR. NASMYTH, the Inventor of the Steam-Hammer, says:—"I am highly pleased with it as a most effective and durable lubricant, having remarkable properties in the way of setting free bearings which had got set fast."

In face of these and hundreds of other letters to the same effect, it is a MERE WASTE OF MONEY to use the dearer kinds for the engines and machinery of collieries and mines, numbers of which are now using the Don Oil instead.
Any company desirous of trying it before adopting it may do so at our risk and expense.
Circulars containing particulars sent on application.
PRICE—By the Ton of 253 Gallons, 2s. 6d. a gallon; by the Cask of 40 Gallons, 2s. 9d.

ECONOMIC LUBRICATING OIL. THE DON

AGENTS WANTED AT HOME AND ABROAD.
DUNCAN BROTHERS,
MANAGERS,
DON OIL COMPANY, 2, BLOMFIELD STREET, LONDON, E.C.

ROBEY AND COMPANY, LIMITED,
ENGINEERS, LINCOLN.



PATENT PORTABLE
HAULING AND WINDING ENGINE
WITH
PATENT DRUM WINDLASSES,
FOR MINING PURPOSES.
This Engine is specially commended to Mining Engineers and others, as by its adoption—
Haulage along inclined drifts is easily and cheaply effected;
The expense of sinking new shafts is greatly reduced, neither foundations nor engine-house being required;
It is available not only for winding, but for pumping, sawing, &c.—a great desideratum at a large colliery;
It can be very quickly removed (being self-propelling), and fixed in any desired position.
Prices and full particulars on application as above, and also references to view the engine in successful work near Derby, Carnarvon, Haverfordwest, Darlington, Durham, Penzance, and other places.
THESE ENGINES WORK WITH MARVELLOUS ECONOMY IN FUEL.

BURLEIGH ROCK DRILLING MACHINERY.

Specially Applicable
TO
SINKING, QUARRYING,
AND
MINING PURPOSES.

THE BEST & ONLY PRACTICAL DRILL.

IT DOES NOT GET OUT OF ORDER.

PROGRESSES through Aberdeen granite at the incredible rate of 10 inches per minute.

SAVES £5 a day as compared with hand labour, independent of the enormous saving effected in the general expense, such as PUMPING, VENTILATION, INTEREST OF CAPITAL, &c., from the fact of the "put out" being increased four-fold.

DRILL POINTS.—The saving in steel alone is considerable. One drill will go through 20 feet of Aberdeen granite without sharpening.

Machine and Stand for Quarrying and Sinking.

PRIZE MEDALS:

Royal Cornwall Polytechnic Society, August 21, 1872.

Liverpool and Manchester Agricultural Show, Sept. 12, 1872.

Middleton Agricultural Show, Sept. 18, 1872.

THOMAS BROWN,
PATENTEE AND SOLE PROPRIETOR.

Orders received and executed solely by—

CHAS. BALL & CO., SOLE AGENTS,
FOR GREAT BRITAIN AND IRELAND.

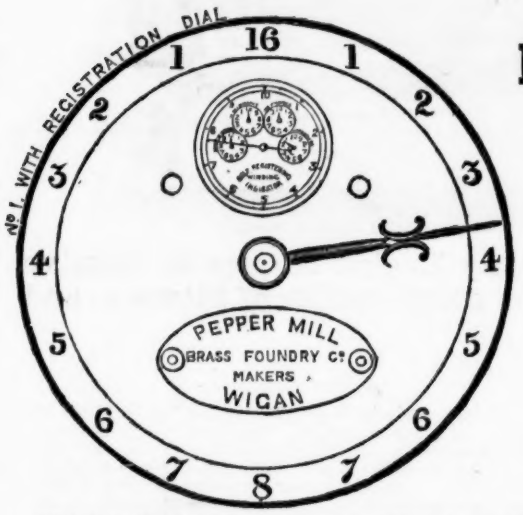
Office: 21, NEW BRIDGE STREET, E.C., LONDON.

PEPPER MILL BRASS FOUNDRY COMPANY,

DARLINGTON STREET, WIGAN,

COLLIERY FURNISHERS,

BRASS FOUNDERS, COPPERSMITHS, & GAS METER MANUFACTURERS,

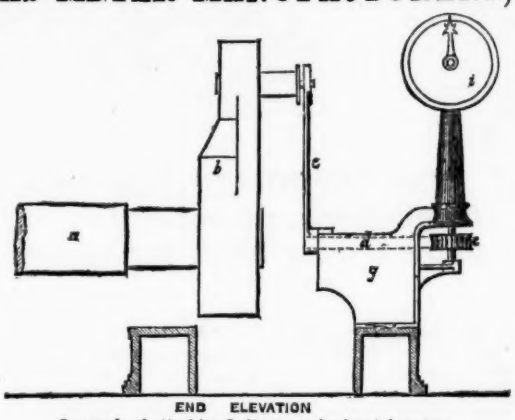


The PEPPER MILL BRASS FOUNDRY COMPANY beg respectfully to invite attention to their IMPROVED SELF-REGISTERING COLLIERY WINDING INDICATOR, which, in addition to its ordinary use of indicating the position of the load in the shaft, registers the number of windings, thus enabling the manager at a glance, and at any moment, to check the return of the banksman or tallyman, by reading off from the dial the number of windings for any stated time.

This Indicator is especially adapted for Water Winding or Pumping. Its indications cannot possibly be tampered with, and unerringly show the number of windings or strokes for any stated period, so that it will at once be seen whether or not the person in charge has been fully discharging his duty.

These Winding Indicators are supplied either with or without the Self-registration Dial.

The Pepper Mill Brass Foundry Company will be glad to furnish, on application, sets of drawings illustrative of the simplest and cheapest mode of attaching their indicators to engines of various constructions, either vertical or horizontal.



END ELEVATION

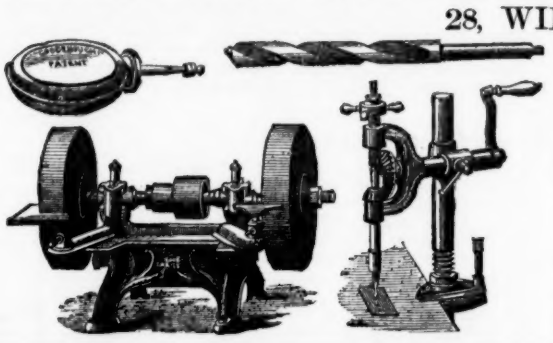
One mode of attaching Indicator to horizontal engine.

These Indicators have been supplied to most of the principal Collieries in Lancashire, including Wigan Coal and Iron Co. (Limited); Ince Hall Coal and Cannel Co. (Limited); Messrs. Jonathan Blundell and Son; John Grant Morris, Esq.; Messrs. Pearson and Knowles; Messrs. Andrew Knowles and Sons; Cannock and Rugeley; Mostyn Coal and Iron Co.; Messrs. Pilkington Bros., St. Helens.

CHARLES CHURCHILL AND CO.,

IMPORTERS AND FACTORS OF AMERICAN MACHINERY AND TOOLS,

28, WILSON STREET, FINSBURY, LONDON, E.C.

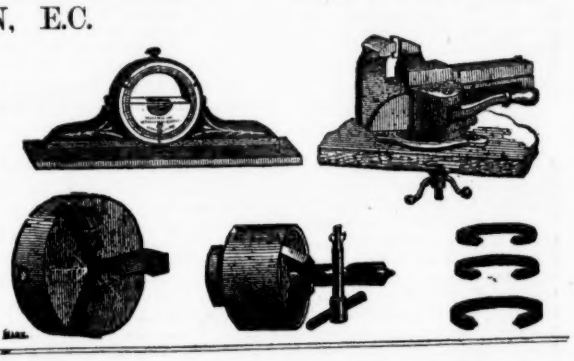


SOLE AGENTS FOR

Morse's Twist Drill, and Machine Company's celebrated Twist Drills and Chucks; American Scroll Chucks; Stephens' Patent Vices; Parker's Patent Parallel and Swivel Vices; Gould Manufacturing Company's Well and Cistern Pumps; Washita, Arkansas, and Hindostan Oil Stones; and all other descriptions of American Tools and Machinery, &c., &c.

C. C. and Co. are prepared to give quotations and execute indents for American Goods of all descriptions, to be shipped to any port.

CATALOGUES AND PRICES CURRENT ON APPLICATION.



OSWALD BROOKE AND CO.,

51, DALE STREET,
PICCADILLY,

MANCHESTER,

PATENTEES AND SOLE MANUFACTURERS
OF
GOVERNMENT
FIREPROOF

BRATTICE CLOTH

AND

AIR TUBING.

WORKS: COLLYHURST.

Letters Patent for New Inventions.
—HASELTINE, LAKE, and CO., obtain Home, Foreign, and Colonial Patents on favourable terms. Instruction and charges on application.

No. 8, SOUTHAMPTON BUILDINGS, LONDON; 23, CHANCE ALLEY, SHEFFIELD; 79, GEORGE STREET, EDINBURGH; and 247, BROADWAY, NEW YORK.

BY HER MAJESTY'S ROYAL LETTERS PATENT.

STANLEY'S PATENT FURNACE,

FOR SMELTING ORE OR RE-MELTING IRON OR OTHER METAL,

PUDDLING AND ALL KINDS OF HEATING FURNACES.

JOHN MARTIN STANLEY, PATENTEE & SOLE LICENSOR, SHEFFIELD.

The advantages of these furnaces are, in the first place, they effect a saving of from 25 to 50 per cent. in fuel.
2ndly, The use and expense of grate-bars are dispensed with, as these furnaces have closed fire-places, formed in brickwork.
3rdly, They make from 80 to 90 per cent. less ashes than open fire-grate furnaces.
4thly, They have a purer flame, the combustion is more complete, and contains less free or unmixed air or gases.
5thly. The workmen have much less labour in working these furnaces.
6thly, They heat quicker, and are more under the control of the furnace-men.
7thly, They are not affected by the position of the wind or draughts.
8thly, The mills and workshops are cooler and more comfortable than where the open fire-grate furnaces are used.

For prices, and other information, apply to J. M. STANLEY, 27, Change-alley, Sheffield.

THOMAS WARDEN,

LIONEL STREET, BIRMINGHAM,

IRON AND STEEL MERCHANT,

Manufacturer of Every Description of Railway, Colliery, and Contractors' Plant.
A LARGE STOCK OF SECOND HAND RAILS AND PLANT ALWAYS ON HAND.

TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON,

CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

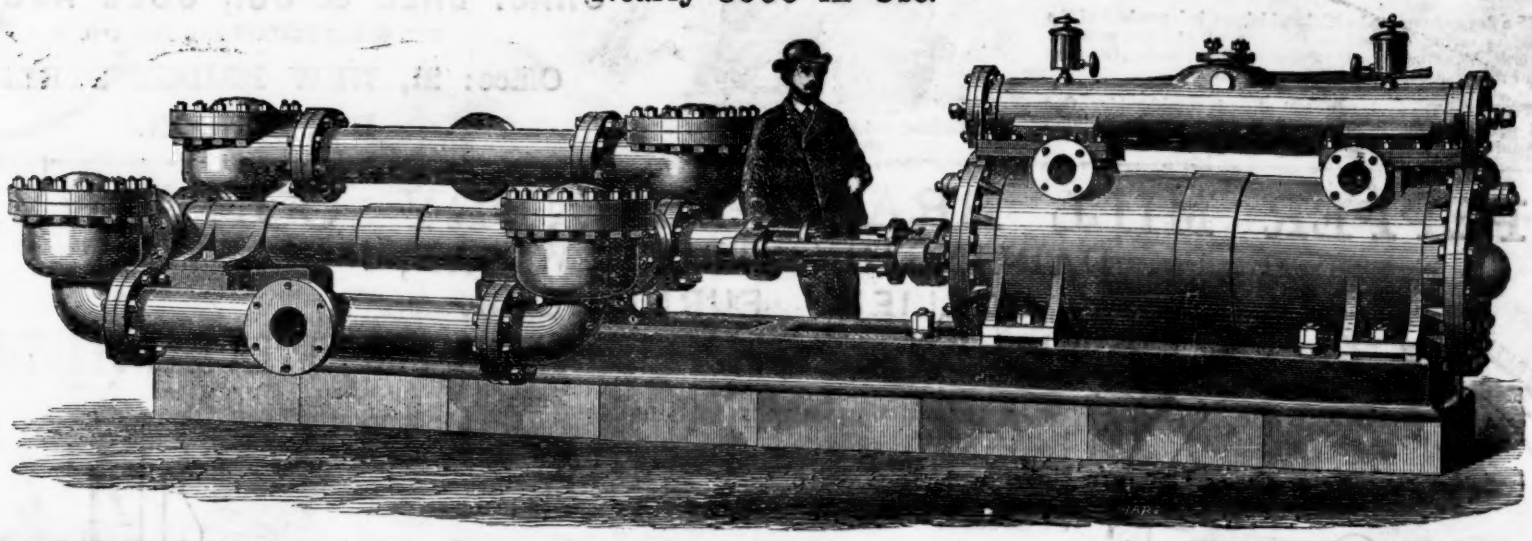
NEWCASTLE-ON-TYNE (TANGYE BROTHERS AND RAKE), OFFICES AND WAREHOUSE, ST. NICHOLAS' BUILDINGS.

SOLE MAKERS OF

THE "SPECIAL" DIRECT-ACTING STEAM PUMPING ENGINES

FOR FORCING WATER FROM MINES.

Nearly 3000 in Use.



The "SPECIAL" Direct-acting Steam Pumping Engines require no costly Engine Houses or massive foundations, no repetition of Plunger Lifts, ponderous Connecting-rods, or complication of Pitwork, and allow a clear shaft for hauling purposes.

Extract from "ENGINEERING," September 6th, 1872:—

"The accompanying engraving illustrates a large specimen of the 'Special' Steam Pump, which was brought before the public about four years since by Messrs. Tangye Brothers and Holman. The Pump is the invention of Mr. S. Cameron, of New York, and since its introduction Messrs. Tangye have turned out nearly 3000 from their works.

"These pumps are of various sizes, and at first only small ones were made, but as their usefulness became developed the manufacturers designed pumping engines on the same principle for use in collieries. They were first applied to this purpose in the Newcastle collieries about three years since, and through the efforts of the late Mr. A. Stansfield Rake, under the direction of Messrs. Tangye, about 130 of these pumps had been introduced—principally in the collieries of the Durham and Newcastle districts, up to the end of 1870. They were adapted to perform the required duty—varying in almost every case—of forcing from 1000 to 10,000 gallons per hour from depths ranging from 100 to 500 ft. The success of this system of pumps led Mr. J. Bigland, the manager of Messrs. Pease's Bishop Auckland Collieries, to conclude that it was adapted for yet heavier work. The result of his investigations into its working led to the manufacture of the engine we have illustrated, for the Adelaide Collieries, belonging to Messrs. Pease, at Bishop Auckland.

"The construction of the Special Steam Pump is so well known that we need now do no more than refer to the dimensions of the various parts. The steam cylinder is 26 in. diameter, and the pump—which is double acting—is 6½ in. diameter, with a 6-ft. stroke. The slide valve is steam-moved, and its alternate action is effected by means of two steel reversing valves, operated by the piston in the interior of the cylinder at either end. Hence there is no external mechanism except the piston rod, a few inches only of which is seen reciprocating between the stuffing boxes of the steam and pump cylinders. In the contract it was stipulated that the engine should raise 120 gallons per minute 1040 ft. high in a single lift, and this is more than accomplished, with apparently as much ease as if its load was delivered at only 100 ft. high.

"The engine-room at the Adelaide Collieries is situated at a depth of 1040 ft. below the surface, and is an arched chamber, about 100 ft. long by 20 ft. wide, and 10 ft. high at centre. At the far end of this chamber is a double-flued boiler, 27 ft. long and 7 ft. in diameter. Placed between the boiler and the shaft is the pumping engine we have been describing. It was started on June 6, 1871, and Mr. Bigland reported that, having measured its duty, he found the average of seven trials to be 137 gallons per minute, thus giving a higher duty than was stipulated for in the contract.

"A still larger Special Steam Pump than the one already described has since been made by Messrs. Tangye for Messrs. Stannier's collieries, Silverdale, Staffordshire. The steam cylinder of this engine is 32 in. in diameter, and the water cylinder 10½ in.; the stroke is 6 ft., and the engine has to raise 22,500 gallons per hour 540 ft. high. Two out of eight engines for some extensive coal mines in Germany are also in a forward state; each of these engines is to be capable of raising 150 gallons per minute, or 9000 gallons per hour, 750 ft. high. This system of underground pumping engine undoubtedly carries with it the recommendations of simplicity and great power, with a small number of mechanical parts. Its first cost is also very moderate, as compared with the method of raising water from great depths by a series of 40 or 50 fm. lifts. Its practical value was attested in 1867 by the award of a silver medal by the Royal Falmouth Polytechnic Society, which is composed chiefly of mining engineers. In fact, these engines appear to solve a very important commercial question in mining operations—viz., the most economical and effective means of deep mine drainage. Their success has been established in the coal mines of Durham and Newcastle, and there is no reason why their adoption should not follow, as occasion requires, in the copper and tin mines of Cornwall, some of which are of great depth; and especially for foreign mines, where transport convenience and economy are of paramount consideration."

The "Special" Steam Pumping Engines are in use at the following among many other Collieries:—

Adelaide Colliery, Bishop Auckland	3	Pumps.	North Bitchburn Colliery, Darlington	2	Pumps.	Stott, James and Company, Burslem	1	Pumps.
Acomb Colliery, Hexham	1	"	Newton Cap Colliery, Darlington	1	"	Straker and Love, Brancepeth Colliery	1	"
Blackfell Colliery, Gateshead	1	"	Normanby Mines	1	"	Seaton Delaval Coal Colliery, near Newcastle	1	"
Black Boy Colliery, Gateshead	1	"	Oakenshaw Colliery	1	"	Thornley Colliery, Ferryhill	2	"
Castle Eden Colliery	2	"	Pease's West Colliery	2	"	Thompson, John, Gateshead	2	"
Carr, W. C., Newcastle	4	"	Pease, J. and J. W., near Crook	5	"	Trimdon Grange Colliery	1	"
Etherley Colliery	1	"	Pease, J. and J., Brandon Colliery	1	"	Tudhoe Colliery	4	"
Gidlow, T., Wigan	3	"	Pegswood Colliery, near Morpeth	2	"	Vobster and Mells Colliery	2	"
Haswell, Shotton and Easington Coal Company	3	"	Pelton Fell Colliery	1	"	Widdrington Colliery, Morpeth	5	"
Lochgelly Iron and Coal Company	2	"	Railey Fell Colliery, Darlington	1	"	Whitworth and Spennymoor Colliery	5	"
Lochore and Capeldrae Cannel Coal Company	6	"	Right Hon. Earl Durham, Fence Houses	1	"	Westerton Colliery, Bishop Auckland	1	"
Leather, J. T., near Leeds	2	"	Skelton Mines	1	"	Wardley Colliery, Gateshead	1	"
Lumley Colliery, Fence Houses	1	"	South Benwell Colliery	5	"	Westminster Brymbo Coal Company	2	"
Monkwearmouth Colliery, Sunderland	1	"	St. Helens (Tindale) Colliery	1	"	Weardale Coal and Iron Company	5	"

PARTICULARS OF THE "SPECIAL" STEAM PUMPING ENGINES SUITABLE FOR HIGH LIFTS IN MINES.

Diameter of Steam Cylinder ...Inches	6	8	10	8	12	16	10	14	18	21	14	18	21	26	16	21	24
Diameter of Water Cylinder ...Inches	3	3	3	4	4	4	5	5	5	5	6	6	6	6	7	7	7
Length of Stroke ...Inches	24	24	36	24	36	48	24	36	36	48	36	36	48	72	36	48	48
Strokes per minute	30	30	20	30	20	15	30	20	20	15	20	20	15	10	20	15	15
Gallons per hour	2,200	2,200	2,200	3,000	3,000	3,000	6,100	6,100	6,100	6,100	8,800	8,800	8,800	8,800	11,900	11,900	11,900
Height in feet to which water can be raised with 40 lbs. pressure per square inch of steam at pump	240	425	665	240	540	960	240	470	775	1,058	330	540	740	1,140	312	540	700
Diameter of Suction and Delivery ...Inches	2	2	2	3	3	3	3½	3½	3½	3½	4	4	4	4	5	5	5
Diameter of Steam Inlet ...Inches	¾	1¼	1½	1¼	2½	2½	1½	2½	3	3½	2½	3	3½	4	2½	3½	4
Diameter of Exhaust ...Inches	1	1½	1¾	1½	2½	3	1¾	2½	3½	4	2½	3½	4	5	3	4	5

PARTICULARS, &c.—*Continued.*

Diameter of Steam Cylinder ...Inches	30	18	24	30	32	18	24	30	36	21	30	36	42	26	36	44	50
Diameter of Water Cylinder ...Inches	7	8	8	8	8	9	9	9	9	10	10	10	10	12	12	12	12
Length of Stroke ...Inches	72	36	48	72	72	36	48	48	72	48	72	72	72	48	72	72	96
Strokes per minute	10	20	15	10	10	20	15	15	10	15	10	10	10	15	10	10	7½
Gallons per hour	11,900	15,660	15,660	15,660	15,660	19,800	19,800	19,800	19,800	24,400	24,400	24,400	24,400	35,240	35,240	35,240	35,240
Height in feet to which water can be raised with 40 lbs. pressure per square inch of steam at pump	1,100	300	540	840	960	240	427	665	960	264	540	780	1,062	282	540	800	1,040
Diameter of Suction and Delivery ...Inches	5	6	6	6	6	7	7	7	7	8	8	8	8	10	10	10	10
Diameter of Steam Inlet ...Inches	5	3	4	5	5½	3	4	5	6	3½	5	6	7	4	6	8	8½
Diameter of Exhaust ...Inches	6	3½	5	6	6½	3½	5	6	7	4	6	7	8	5	7	9	10

PRICES OF THE ABOVE ON APPLICATION.

Any combination can be made between the Steam and Water Cylinders, to suit Height of Lift and Pressure of Steam.

TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney Lane, London, E.C.

1872.

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